CommPlete™
COMMUNICATIONS SERVER

MR9600-100 Controller
User Guide

MultiTech® Systems

MR9600-100 Controller User Guide

P/N 82067502, Revision C

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Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Important Safety Instructions

Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

The MR9600-100 Controller circuit board includes a battery that maintains the MR9600-100's setup information when it is turned off or disconnected from power. The battery can maintain the setup information for approximately 10 years with no external power, and longer when the MR9600-100 is turned on and operating normally. This battery is soldered onto the circuit board and cannot be replaced by the user.

If, for some reason, the MR9600-100's battery should fail, please contact Multi-Tech Technical Support at (800) 972-2439 for replacement instructions.

Table of Contents

1 Introduction

Introduction 2
Product Description 2
LED Indicators 2
  Card Status LEDs 3
  MR9600-100 Ethernet Status LEDs 3
  Ethernet Switch LEDs 4
Connectors 4
  Duplex Mode Jumpers 5
MR9600-100 Controller Specifications 5
  Ethernet Switch Specifications 5
100BASE-TX Technology Overview 6
  Cables and Connectors 6
  Topology 6
  Network 7
  Hubs 7
  Connectivity Rules 7
Switching Technology 7
  Benefits of Switching 8
  10/100 Switching Technology 8

2 Installation

Introduction 12
Installation Procedure 12
Ethernet Cabling 12
Serial Cabling 13
Network Connections 13
  10M bps Ports 13
  100M bps Ports 13
  Cable Types 13
Setting the Duplex Mode (JP1-JP5) 14

3 Operation

Introduction 18
Security 18
File System 18
Event Files 18
SNMP Interface 19
Command Line Interface 19
Telnet Interface 20
Web Browser Interface 20
  Logging In 21
  Getting Modem Information 21
  Controlling Modems 21
  Web Interface Limitations 21
FTP Interface 21

4 Commands

Parameter Types 24
Commands Listed by Function 26
Commands Listed by Security Level 30
Command Reference 33
Error Messages 77

5 Solving Problems

Introduction 82
MR9600-100 Diagnostic Tests 82

Appendix A - Connector Pinouts 85

RJ-45 Connectors 85

Index 89

1 Introduction

Introduction

This manual describes the field installation of a Multi-Tech MR9600-100 Controller (henceforth, MR9600-100) into a CommPlete Communications Server chassis. This manual also contains a reference guide to the commands that are used to configure and control the MR9600-100. For configuration instructions, refer to the System Installation and Quick Start section of you CommPlete documentation set.

Product Description

The MR9600-100 is the system controller module for the CommPlete Communications Server. The MR9600-100 contains a built-in Web, FTP, and Telnet server, an embedded SNMP agent, and an unmanaged Ethernet switch module. Its complete management capabilities allow the CommPlete Communications Server and its segments to be managed remotely across any TCP/IP network.

LED Indicators

The MR9600-100 front panel contains the following LED indicators.

- Card status LEDs 1–16
- MR9600-100 Controller Ethernet status LEDs 1–4
- Ethernet switch LEDs

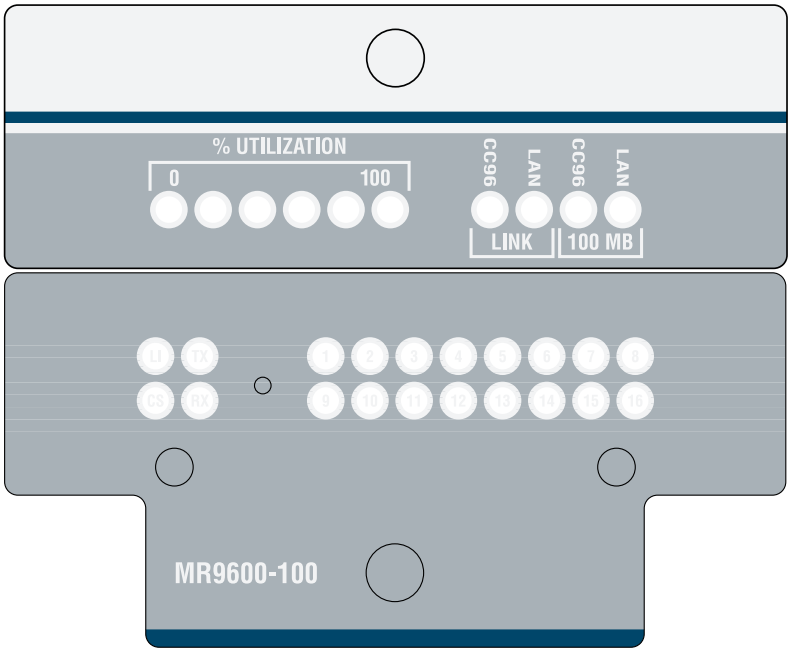

Figure 1. MR9600-100 Controller front panel.

Card Status LEDs

The lower part of the MR9600-100's front panel contains 16 two-color LED indicators, one for each card slot in the CC9600 chassis. The slots are numbered 1 through 16 from left to right. The LEDs indicate the state of the device cards installed in the CC9600 chassis. When the MR9600-100 is turned on, the lights go through the following sequence before they act as status indicators for the device cards.

1. The LEDs on the right side turn red and then turn green when the right SIMM passes its memory test.
2. The LEDs on the left side turn red and then turn green when the left SIMM passes its memory test.
3. The LEDs stay green for about five seconds while the flash boot code waits for a handshake sequence on the diagnostic serial port.
4. If none is detected (this is normal unless the firmware is being updated through the diagnostic port) the main controller code starts running and the LEDs are turned off.
5. The LEDs are turned on and off, one at a time, red and green.
6. All LEDs turn green while the system starts up.
7. After the system has started, the LEDs reflect the status of the device cards. Each LED will be in one of the following states, depending on the device card.

LED Color	Device Card Status
Off	Card not installed.
Green	Card installed and all devices are communicating with the MR9600-100.
Red	Card installed and none of the devices are communicating with the MR9600-100.
Flashing Red/Green	Card installed and one or two devices are not communicating with the MR9600-100.

MR9600-100 Ethernet Status LEDs

The lower part of the MR9600-100 front panel contains four indicators that show the status of the MR9600-100 Controller's Ethernet port.

LED Indicator		Color	Indication
LI	Link Integrity	Yellow	On during a good link
CS	Collision Sense	Red	On when there is a collision on the Ethernet port
TX	Transmit	Green	On during Ethernet transmit
RX	Receive	Green	On during Ethernet receive

Ethernet Switch LEDs

The upper part of the MR9600-100 front panel contains 10 status indicators for the Ethernet switch.

LED Indicator	Indication
UTILIZATION	Percentage of bandwidth in use. Each LED that is on represents a 16.7% increment in use. The lower 4 LEDs are green, and the two LEDs indicating highest activity are yellow.
CC9600 (LINK)	On during a valid Ethernet link on a 10 Mbps port.
LAN (LINK)	On during a valid Ethernet link on a 10 Mbps LAN port.
CC9600 (100 MB)	On during a valid Ethernet link on a 100 Mbps port. Off during a 10M bps connection.
LAN (100 MB)	On during a valid Ethernet link on a 100 Mbps LAN port. Off during a 10M bps connection.

Connectors

The MR9600-100 has three connectors that are accessible from the rear of the CC9600 chassis.

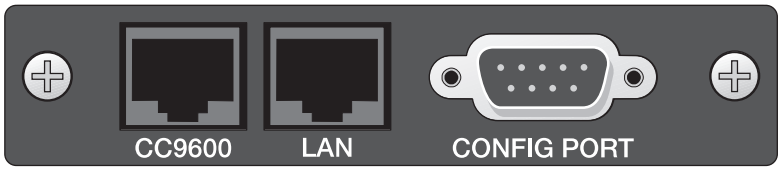

Figure 2. MR9600-100 connectors.

Connector	Type	Function
CC9600	RJ-45	Crossover 10/100M bps network connector. The transmit and receive pairs of wires are swapped so the connector can be used with a straight-through cable to connect the CommPlete Communications Server to an external switch or to the LAN connector on another CommPlete Communications Server.
LAN	RJ-45	Straight-through 10Base-T network connector. Use with a straight-through cable to connect the CommPlete Communications Server to a network card in a server, to a network wall connector, or to the CC9600 connector on another CommPlete Communications Server.
CONFIG PORT	Male DB-9	RS-232C configuration port for MR9600-100 Controller.

Duplex Mode Jumpers

The MR9600-100 must be set to the proper duplex mode for all ports. To set the duplex mode, change the Duplex Mode jumpers on the back of the MR9600-100. Note that it is not necessary to turn off the device when changing the duplex mode setting.

Note: Full-duplex mode can only be used for connections to other switches or to network stations. Connections to hubs must use half-duplex mode only.

MR9600-100 Controller Specifications

- Motorola MC68360 25 MHz microprocessor
- 8 MB of RAM for volatile storage
- 2 MB of flash memory: 1 MB for program space and 1 MB for nonvolatile file system space
- Recessed reset button
- Sixteen two-color LEDs for quick view of device card status
- Four Ethernet status LEDs
- Dimensions: 7.3 × 8.9 ×33.0 cm (H × W × D)
  2.87 × 3.5 × 13 inches (H × W × D)
- Weight: 0.45 kg (1.0 lb.)
- Operating temperature: 0°–40° C (32°–104° F)
- Operating humidity: 0–95%, non-condensing (0-95%, storage)
- Operating altitude**:** 10,000 ft (3048 m)
- Power input: 100 ~ 240 VAC, 50/60Hz
- Power: 4.8 A @ 5 V
- Power Consumption: 15 watt (max.)
- Fuse: 7 A on 5 V supply
- Limited Warranty: Two years

Ethernet Switch Specifications

- Two high-speed uplink ports for connecting to a higher-tier switch or other device. The two RJ-45 100Base-T/10Base-TX connectors provide connection to a TCP/IP Ethernet network
- Full- and half-duplex capability on all ports; the five 10BaseT ports are user-configurable via the Duplex Mode jumpers on the printed circuit board (PCB).
- One male DB-9 RS-232C diagnostic and configuration connector
- Six Ethernet utilization LEDs

- Two Ethernet link indicator LEDs
- Two Ethernet 100M bps indicator LEDs
- 10BASE-T, IEEE 802.3, 100BASE-TX, and IEEE 802.3u compliance
- 100Mbps (100BASE-TX) mode via RJ-45 (Cat 5);
  Full or Half Duplex – 100/200Mbps
- 10Mbps (100BASE-TX) via RJ-45 (Cat 3), Full or Half Duplex – 10/20Mbps
- Filtering Rates: 14880 pps for 10Mbps ports and 148800 pps for 100Mbps ports
- Forwarding Rates: 14880 pps for 10Mbps ports and 148800 pps for 100Mbps ports
- Shared memory architecture
- Dynamic buffer allocation allows network load balancing and prevents packet loss due to congestion
- 8K active MAC address entry table per device, with self-learning and table aging
- auto-polarity correction for all twisted-pair ports
- Weight: 500 g (1.1 lbs)

100BASE-TX Technology Overview

100M bps Fast Ethernet is a relatively new standard specified by the IEEE 802.3 LAN committee. It is an extension of the 10Mbps Ethernet standard with the ability to transmit and receive data at 100Mbps, while maintaining the CSMA/CD Ethernet protocol. Since 100Mbps Fast Ethernet is compatible with all 10Mbps Ethernet environments, it provides a straight-forward upgrade without wasting your investment in hardware, software, and personnel training.

The MR9600-100 provides an easy, affordable, high-performance, seamless, and standards-based migration path to a 100BASE-TX LAN while preserving your initial investment and use of 10Mbps Ethernet LANs.

The MR9600-100 complies with IEEE802.3u, 100BASE-TX, IEEE 802.3 and 10BASE-T standards. The MR9600-100 has five 10Mbps twisted-pair ports and two 100Mbps twisted-pair ports. The MR9600-100 provides a store-and-forward token passing scheme. Filtering and forwarding rates for the MR9600-100 run at wire-speed, reducing latency within and across segments.

Cables and Connectors

The MR9600-100 supports Category 5 unshielded twisted-pair (UTP) cables. Cat 5 UTP cable uses the same RJ-45 connector used with 10BASE-T, wired in the same configuration. Please note that the punch-down blocks in the wiring closet must also be Category 5 certified. Where these blocks do not meet the standard, an upgrade is necessary.

Topology

A Fast Ethernet workgroup is configured in a star topology and is built around a maximum of two repeaters. Each workgroup forms a separate LAN (also known as a “segment” or “collision domain”), and these workgroups can be easily interconnected through switches, bridges, or routers to form one LAN large enough to encompass a high-rise building or campus environment. Recent innovations in LAN hub

technology such as stackable hubs, coupled with the decreasing cost of switches, bridges, and routers, allow the design of low-cost, efficient Fast Ethernet workgroups and enterprise LANs.

The following factors strongly influence the architecture of Fast Ethernet networks:

- The EIA/TIA 568 Wiring Standard imposes a 100 meter limit on horizontal runs of twisted-pair cables; that is, connections from the wiring closet to the end-station.
- Fast Ethernet's increased operational speed reduces the maximum distance between all elements of the LAN (see below).
- The EIA/TIA 568 Wiring Standard does not support the use of coaxial cables for horizontal wiring.

Network

The network diameter, which is the distance between two end-stations in the same collision domain, is the primary difference between traditional Ethernet and Fast Ethernet. Due to the increased speed in Fast Ethernet and adherence to the EIA/TIA 568 wiring rules, the network diameter of a Fast Ethernet collision domain is limited to 205 meters; in contrast, the maximum 10BASE-T Ethernet collision domain diameter can be up to 2500 meters.

Hubs

While 10BASE-T hubs are all functionally identical, Fast Ethernet hubs are divided into two distinct types: Class I and Class II. A Class I hub repeats all incoming signals on one port to the other ports by first translating them to digital signals and then retranslating them back to line signals. These translations are necessary when connecting various network media to the same collision domain, such as when combining two wire-pair 100BASE-TX media with four wire-pair 100BASE-T4 media. Only one Class I hub can exist within the same collision domain, thus this type of hub cannot be cascaded. A Class II Hub (or "repeater"), on the other hand, immediately repeats all incoming line signals on one port to the other ports; no translations are performed. This type of hub connects identical media to the same collision domain; for example, TX to TX. At most, two Class II hubs can exist within the same collision domain. The cable used to cascade these hubs is called an inter-repeater link (IRL).

As mentioned earlier, stackable hubs can be used to increase the number of available nodes in a collision domain. An entire hub stack counts as a single hub (repeater).

Connectivity Rules

- The maximum length of a twisted-pair segment (that is, distance between a port in the hub to a single-address network device such as a PC, server, or LAN switch) is 100 meters.
- The maximum diameter in a collision domain is about 205 meters using two Class II hubs (or hub stacks) and 200 meters using one Class I hub.
- Between any two end-stations in a collision domain, there may be up to three segments and two Class II hubs or two segments and one Class I hub.

Switching Technology

Switching is fast becoming the industry standard for pushing the limits of existing Ethernet networks. A switch bridges Ethernet packets between Ethernet and Fast Ethernet LAN segments at the MAC address level of the Ethernet protocol.

The difference between switched Ethernet (10Mbps, 100Mbps, or both) and traditional Ethernet is analogous to the difference between a private phone line and a party line. With switched Ethernet, each workgroup has a "private line" so that transmitted packets don't have to wait as long to gain access to the network. When connected to a switched port, each Ethernet segment has full "wire-speed" access, so a switch effectively divides a single Ethernet LAN into bridged multiple LAN segments. Each segment can support a workgroup or even provide a dedicated connection for a key workstation or server. The result of dividing an Ethernet LAN into multiple segments is a multiplication of internal bandwidth available to all stations on the LAN and a reduction in latency rates during peak-use periods.

Benefits of Switching

Ethernet switching technology drastically increases the total bandwidth of a LAN. It also provides configuration flexibility to local workgroups which allows the network administrator to better control how network resources are distributed against network load. Switching helps reduce the congestion problems inherent in the contention-oriented CSMA/CD protocol, thereby improving network response during high utilization periods.

Also, currently popular distributed client/server applications often require higher bandwidth and tighter client-to-server integration. Legacy 10Mbps Ethernet often is unable to provide a sufficiently sophisticated platform for users to be able to take full advantage of such client/server applications.

Fast Ethernet switching not only satisfies both technical and business needs, it also preserves the current investment in the huge 10BASE-T Ethernet installed base. Compatibility with 10Mbps Ethernet ensures that users will be able to migrate to Fast Ethernet at a pace appropriate to their installation and needs.

10/100 Switching Technology

An integral extension of Fast Ethernet, 10/100 switching provides not only a 100Mbps high-speed connection for carrying aggregated 10Mbps traffic, it also handles the necessary conversion of the MAC layer between 10BASE-T and 100BASE-TX. Combining Fast Ethernet and switching technologies provides both bandwidth for local workgroups and a high-speed link to carry local traffic elsewhere in the network.

2 Installation

Introduction

This chapter describes how to install the MR9600-100 Controller into a CommPlete Communication Server CC9600 chassis. This equipment should only be installed by properly qualified service personnel.

The MR9600-100 Controller assembly consists of the MR9600-100 Controller card, an integrated Ethernet switch card, and a common front panel. Figure 3 shows the layout of the MR9600-100 card without the switch. The MR9600-100 assembly plugs into bus connectors on the inside of the CC9600 chassis. Three communications connectors on the switch module are accessible from the back of the CC9600 chassis: a DB-9 serial connector for MR9600-100 diagnostics and configuration, and two 10/100M bps connectors for network access.

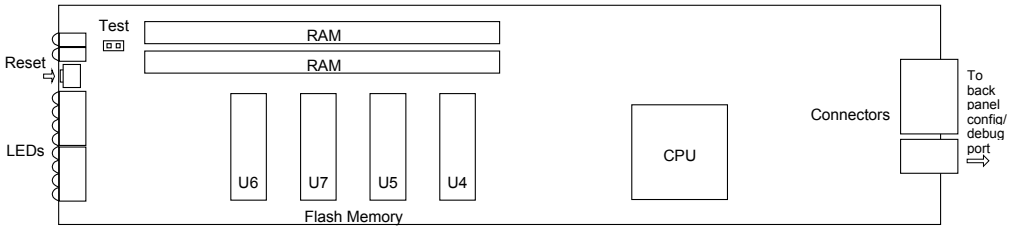

Figure 3. MR9600-100 Controller card. Ethernet switch module not shown.

Installation Procedure

1. Unpack the MR9600-100 assembly from its packaging, and save the packaging for possible future use. Perform a visual inspection of the MR9600-100. If you are concerned about the condition of the MR9600-100, call Technical Support for instructions.
2. Remove the blank controller panel or previous MR9600-100 controller from the CC9600 chassis. The MR9600-100 is hot-swappable.
3. Holding the MR9600-100 by its handle and the edges of the bottom panel, place the MR9600-100 into the open controller slot of the CC9600. Make sure the edges of the MR9600-100 card mate properly with the plastic guides in the CC9600.
4. Slide the MR9600-100 into the CC9600 chassis until you feel the MR9600-100's connectors fit into the bus connectors at the back of the CC9600.
5. Tighten the MR9600-100's retaining screws.
6. Turn on the PS9600 power supplies, if they are off.
7. Note the PS9600 LED indicators. If they are not lit, see Chapter 6. If they are lit, proceed with MultiModemManager operation (Chapter 4 of the MultiModemManager *User Guide* manual).

Note: A self-test runs each time the CommPlete Communications Server is turned on. Refer to Chapter 5 of the MultiModemManager *User Guide* manual for more details on the power-on self-test.

Ethernet Cabling

Two female 10/100M bps connectors are accessible from the back of the CC9600 chassis. Connect one of these connectors to the TCP/IP network that the supervisor console is attached to. The supervisor console

is the PC that runs the MultiModemManager software or, optionally, a third-party SNMP manager. Note that for 10M bps connection, you can use Category 3 (Cat 3) or Cat 5 cable; for 100M bps connection you must use Category 5 (Cat 5) cable.

Serial Cabling

Use the 9-pin RS-232 connector on the back of the CC9600 chassis for diagnostics and configuration.

Network Connections

If any port on the MR9600-100 is set for full duplex operation, the device (or LAN) connected to that port must also be set for full duplex operation. Refer to the following sections on 10M bps and 100M bps ports for specific requirements.

10M bps Ports

The five 10M bps ports are used internally for the four CommPlete segments and the Controller. The 10M bps ports operate at a user-selectable effective speed of 10M bps in half-duplex mode, or at 20M bps in full-duplex mode. In either mode, the twisted-pair connector can operate over 100 meters of Category 3, 4, or 5 UTP/STP cable. Note that the MR9600-100 back panel has two RJ-45 connectors. Refer to Figure 2 for the proper connector type (cross-over or straight through).

100M bps Ports

The two 100M bps ports use standard RJ45 twisted-pair connectors with unshielded or shielded twisted-pair (UTP/STP) wiring. The 100M bps ports operate at an auto-negotiable neffective speed of 100M bps (in half-duplex mode) or 200M bps (in full-duplex mode). In either mode, the twisted-pair connector can operate over 100 meters of Category 5 UTP/STP cable. (Cat 3 cable can be used if the 100M bps port is running at 10M bps.)

The two 100M bps ports can auto-negotiate for 10/20/100/200M bps operation. Note that the MR9600-100 back panel has two RJ-45 connectors. Refer to Figure 2 for the proper connector type (cross-over or straight through).

Port	Connector	Half-/Full-Duplex Effective Speed	CableLength/Type
10M bps	(internal)	10/20M bps	100m/Cat. 3/4/5 UTP/STP
100M bps	RJ-45	10/20M bps	100m/Cat. 3/4/5 UTP/STP
		100/200M bps	100m/Cat. 5 UTP/STP

Cable Types

Under most conditions, the ports on the MR9600-100 may use normal straight-through cables. Some circumstances, however, may require cross-over cables (i.e., cables in which the twisted-pair outputs have been crossed). See Appendix B for more information on cable pinouts.

Setting the Duplex Mode (JP1-JP5)

Each 10M bps port can be set for half-duplex or full-duplex operation. At half-duplex operation, packet transmission and reception do not occur simultaneously, thus communication speed is limited to 10Mbps in 10BASE-T mode. At full-duplex operation, packet transmission and reception occur simultaneously, thus communication speed is doubled to 20Mbps using 10BASE-T mode. Full-duplex operation can be used on links between the MR9600-100 and any device (or station) that supports full-duplex operation.

Set the 10M bps duplex mode using jumpers JP1-JP5 on the top PCB located behind the front panel.
To set a port (e.g., "P1" in the figure below) to full-duplex operation, jumper the top two pins together for that port.
To set a port (e.g., "P5" in the figure below) for half-duplex operation, jumper the bottom two pins together for that port.

Refer to the figures below for 10M bps Half-duplex/Full-duplex mode jumper locations and settings. Note that it is not necessary to turn off power to the MR9600-100 when changing the duplex mode setting.

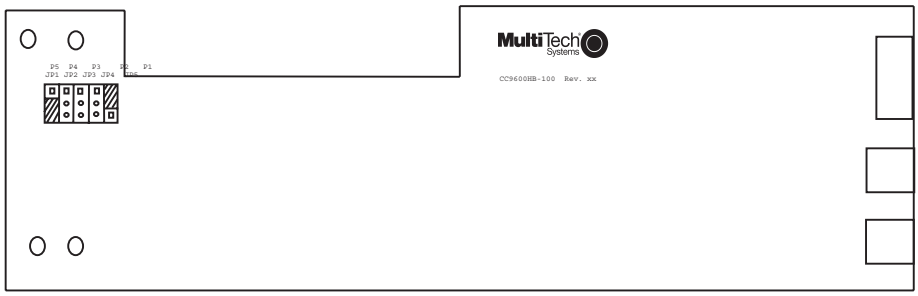

Figure 4. 10M bps Half-duplex/Full-duplex mode jumper locations.

Note: *Full-duplex mode can only be used for connections to other switches, network servers, or network stations. Connections to hubs must use half-duplex mode only. Jumpers are not necessary for 10/100M bps ports (which can auto-negotiate for 10/20/100/200M bps operation).*

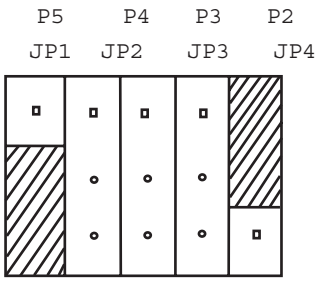

Figure 5. 10M bps Half-duplex/Full-duplex mode jumper settings.

In the figure above, port #1 (“P1”) is set to full-duplex operation by placing the shorting plug over the top two pins of jumper JP5.

Port #5 (“P1”) is set to full-duplex operation by placing the shorting plug over the bottom two pins of JP1.

3 Operation

Introduction

You can operate the MR9600-100 by using the front panel indicators for information (see Chapter 6). But if you install the optional MultiModemManager software, you can operate the MR9600-100 by running windows-based menu and command functions from a dedicated management console (refer to the MultiModemManager User Guide).

Security

The MR9600-100 has a security system to prevent unauthorized system modification by Telnet, Web browser, or FTP users who access the system via the TCP/IP network or the diagnostic serial port on the back of the CC9600 chassis. SNMP and MultiModemManager software security is accomplished by selecting SNMP read and write community strings. Note: SNMP issues relate to the SNMP-managed MR9600-100 chassis, but not to the unmanaged CC9600HB-100 Ethernet switch.

There are three levels of security: *guest*, *operator*, and *supervisor*. There are default user IDs and passwords for each level (see following table).

	Supervisor	Operator	Guest
Security Level	Can perform all management commands	Can perform non-destructive management commands	Can only view information
Default User ID	supervisor	operator	guest
Default Password	supervisor	operator	guest

Once you are logged in, you can change your user ID and password by using the commands **userid** to change your user ID, and **passwd** to change your password (see Chapter 5).

File System

The MR9600-100 stores configuration, security, and event information in files. There are two drives on the system: A and B. The A drive is used for nonvolatile information such as configuration and security database files, and is about 1 MB in size. The B drive is for volatile information such as event files, and is about 6.5 MB in size. Each drive has an MMM directory on it. A:\MMM stores all configuration information for the system. B:\MMM\MR.LOG contains all of the event files for the system. The file system can be accessed either through the command line interface or by using FTP.

Event Files

One event file is created for each hour in the format MMDDHHYY.HR, where MM is the month, DD is the day, HH is the hour, and YY is the last two digits of the year. When the drive fills up, the oldest .HR file is deleted. The number of events your MR9600-100 will hold depends on the number of calls you receive in a day. Event files can be FTPed from the MR9600-100 and analyzed using the Statistical Analyzer, which is part of the MultiModemManager software.

SNMP Interface

The MR9600-100 can be monitored and controlled by using SNMP through the MultiModemManager or a third party SNMP manager.

Note that SNMP issues relate to the SNMP-managed MR9600-100 controller, but not to the unmanaged CC9600HB-100 Ethernet switch.

To receive traps from the MR9600-100, the SNMP manager should log in using the entry in the system table. In that entry, do a set of "login PUBLIC." When you are done monitoring the MR9600-100, do a set of the same variable with "logout." This will stop traps being sent to your station. MultiModemManager does this automatically.

Command Line Interface

The MR9600-100 provides a complete command line interface that enables you to do most of your management functions through either the MR9600-100's diagnostic serial connector or, more likely, by using Telnet. When first setting up your MR9600-100, you must use the MR9600-100 diagnostic serial connector to set up the system's TCP/IP information, such as its IP address, default gateway IP address, etc., as described in the MR9600-100 Quick Start in Chapter 3.

When you first connect with the MR9600-100, either in Telnet or by using the serial port, you will be prompted for a user ID and password. Enter the correct user ID and password for the desired security level (see "Security" on page 18). Once you are logged in, the screen should show the following information.

```
Welcome to MultiModemManager MR9600-100
version 2.20 (APR 24 1998 18:06:37) 4/29/1998 3:14pm

Press any key to start system
manually...starting.....done

Username: supervisor
Password *********

[0] A:\ #
```

The command line prompt is the current directory followed by a # character. You can switch between the MR9600-100's two drives, A and B, by using the **cd** command or by typing **A:** or **B:**. A standard set of DOS and UNIX file system commands are available, though in limited fashion (no wildcards are supported, etc.). See Chapter 5 for command functions and limitations.

Some commands allow you to monitor activity on the CommPlete's modems. The commands **getmodems**, **getcalls**, and **getfaults** allow you to see the current state of the modems, the connection history of the modems, and the history of faults on the modems, respectively.

Information that does not fit on the screen is displayed one page at a time by using a **--MORE--** prompt. When you see this prompt, you have the option of quitting the list by typing **Q** or continuing the list by typing anything else.

Some commands allow you to change the current state of the modems. With the commands **oosset, oosclear**, **reset**, and **config**, you can set modems in or out of service; reset them, or configure them, respectively.

Use the **logout** command when you are done using the command line interface, in order to leave the MR9600-100 in a secure state.

For a complete list of the MR9600-100's commands, see Chapter 5.

Telnet Interface

Telnet is a standard Internet protocol that allows a remote connection between two systems connected to a TCP/IP network such as the Internet. The MR9600-100 can be managed remotely by using Telnet. Telnet can give the user access to all management functions through the command line interface.

There is an inactivity timer associated with the Telnet session. If there is no activity for 10 minutes, then the Telnet session will close.

Web Browser Interface

The MR9600-100 can be monitored and controlled from a World Wide Web browser such as Netscape Navigator version 2.0 or later, or Microsoft Internet Explorer version 3.0 or later.

Two interfaces are available: an HTML framed interface (in which the browser screen is split into separate frames) and a non-framed interface. To use the framed interface, type the following URL in your browser's URL entry line and press ENTER:

http://111.222.333.444/mmm/main.html

For the non-framed interface, use the following URL:

http://111.222.333.444/mmm/standard.html

In both examples, 111.222.333.444 represents your card's IP address.

Logging In

Whenever you access the MR9600-100 for the first time during a browser session, you will be prompted for a user ID and password. You must log in as someone of security level operator or higher to get access to the Web interface.

Both the framed and the non-framed interfaces present logged-in users with a list of available views (Framed or Standard), a list of operations, and a list of information views. These are all available via hypertext links.

Getting Modem Information

In each interface the same information is available in table format. There are tables of information about modems, calls on modems, modem and system faults, and system version. In the framed version these tables appear in frames on a single HTML page; in the non-framed version each table appears on a separate HTML page.

Controlling Modems

In either interface, the user can reset modems, set modems in or out of service, and configure modems. When the user selects the hot link for an operation, a form appears in which the user can enter in list format (e.g., 1A:3C,15B) the modems that are to have the desired operation performed on them. The operation is performed when the user selects the action button (e.g., **Config** if the user is configuring modems).

Web Interface Limitations

The Web interface does not provide a full management interface. Full management is provided by our MultiModemManager software, or through the use of a third party SNMP manager. However, once the system is set up, most management can be done using the Web browser interface.

FTP Interface

FTP (File Transfer Protocol) is a standard Internet protocol that allows the transfer of files between two systems connected to a TCP/IP network, such as the Internet. The MR9600-100 acts as an FTP server so that FTP clients can send and receive files to and from it.

You need FTP to transfer configuration files (*.cfg) to and from your system. If you plan to use MultiModemManager security, you need FTP to transfer security files (*.db) to and from your system. If you wish to analyze event information, you also need FTP to transfer event files (*.hr) from the MR9600-100 to a management computer where you can run the Statistical Analyzer on them.

Note: When logging in, you must use the Supervisor user name and password.

4 Commands

Parameter Types

Many MR9600-100 commands require a parameter to complete the command. Most of the required parameters fall into one of the four following types.

Pathname

Description: A DOS-style path and/or file name. A partial path assumes the current directory.

Full *pathname* example: a:\mmm\MR9600-100.ini

Partial *pathname* example: MR9600-100.ini

The preceding partial pathname gives the same result as **a:\mmm\MR9600-100.ini** if the current working directory is **a:\mmm**.

Device

Description: A list of modems or T1 devices separated by commas. No spaces are allowed. A colon selects a range of devices from the device preceding the colon through the device following the colon.

The device identifier includes the device's slot number and device letter. A CommPlete Communications Server has 16 slots, numbered from left to right, with the RASCards occupying slots 1, 5, 9, and 13. Each modem card contains 8 modems, represented by the *letters A, B, C, D, E, F, G,* and *H*. Thus, 7D is the fourth modem in slot 7.

Examples:

The following two strings each select modems 1A, 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 3A, 3B, and 4C:

1A,2A:3B,4C
1A,2A,2B,2C,2D,2E,2F,2G,2H,3A,3B,4C.

Note: T1 devices can exist only at 1b, 1c, 5b, 5c, 9b, 9c, 13b, and 13c.

IP Address

Description: An IP address string consisting of four decimal numbers separated by periods. Each number may have up to three digits.

Example: 192.168.4.25

IP Address Mask

Description: An IP address string consisting of four decimal numbers separated by periods, in which only the decimal numbers 255 and 0 are permitted. It is used to select a set or range of IP addresses. The standard Class A mask is 255.0.0.0, the standard Class B mask is 255.255.0.0, and the standard Class C mask is 255.255.255.0.

Example: 255.255.255.0

Commands Listed by Function

This section lists the MR9600's commands alphabetically by the following functions: Display, Environment, File, Modem Control, and Security.

For an expanded description of each command, see "Command Reference" on page 33.

Display

Command Name	Parameter	Description
getcalls	Device	Displays call traffic for the device
getfaults	Device	Displays faults for the device
getmodems	Device	Displays the current status for the device
getpowerstatus, getps	None	Displays the main power supply/supplies status and which segments are powered up
getrack	Device	Displays the chassis type
getslots	None	Displays hardwrae type and location in rack
gettemp	None	Displays the internal ambient temperature of the rack in degrees Fahrenheit and Celcius.

Environment

Command Name	Parameters	Description
bpstatus	None	Displays the rack's back plane polling activity between the controller and each powered device
cl, clock	None	Displays current date and time
date	None	Prompts you for current date
getgateway	None	Display the configured gateway address
getip	None	Display the configured IP address
Getprichannels	Device	Retrieve the current status of each B-channel and modem channel under the control of the PRI card.
getreadcommunity	None	Displays the Read community settings
getsendtrap	None	Displays whether traps are being sent or not.
getsubnet	None	Display the configured subnet mask
gettrap	None	Display the configured trap address
getwritecommunity	None	Displays the Write community settings
more	Pathname	Displays the contents of a file, one apge at a time
priocbchannel	Device	Set the specified channel in service
priosbchannel	Device	Set the specified channel out of service
pristatus	Specifier	Retrieve the current status of the specified PRI card
prisetup	Specifier	Set configuration parameters for a PRI card.
se, setenviron	None	Conteoller configuration utility (a menu drivin system used to set global defaults and configure system devices)

setgateway	IP Address	Configure the gateway address
setip	IP Address	Configure the IP address
setpollingoff	Device	Disables the controller generated polling to specified device
setpollingon	Device	Re-enables polling between controller and specified device
setrasostype	Device	Lets the controller know what operating system is loaded on each segment
setreadcommunity	None	Change the Read community settings
setsendtrap	On/Off	Changes the status of sending traps.
setsubnet	IP Address Mask	Configure the subnet mask
settrap	IP Address	Configured the trap address
setwritecommunity	None	Change the Write community settings
t1cfg	Device	Sends stored configuration data to a T1 device
t1debug	Device	Displays status of AB Signalling bits for both the transmit and receive directions of each DSO channel for the specified T1 device within the CommPlete
t1setup	Device	Configures a T1 device
t1status	Device	Displays the status of a T1 device
time	None	Prompts you for current time
update	Pathname Device	Updates firmware of the controller, T1 cards, or modems.
uptime	None	Displays date and time since the last boot
version, ver	None	Displays the version number and release date of the CC9600 Controller's Operating System

File

Command Name	Parameters	Description
cat	Pathname	Display the contents of an ASCII text file
cd, chdir	Pathname	Change to the specified directory
copy, cp	Pathname1 Pathname2	Copy a file from Pathname1 to Pathname2
del, delete	Pathname	Delete a file
dir	Pathname	Display the contents of a directory
download	Pathname	Download a file from the MR9600 controller
ls	Pathname	Display the contents of a directory
md, mkdir	Pathname	Make directory
online	Device	Allows the user to perform AT commands with the selected device

rd, remdir	Pathname	Remove directory
ren, rename	Pathname	Rename a file
rendir	Pathname	Rename a directory
rm	Pathname	Delete a file
sync	None	Writes outstanding events to the Log directory
type	Pathname	Display the contents of an ASCII text file
upload	Pathname	Upload a file to the MR9600.

Modem Control

Command Name	Parameters	Description
cfg, configure	Device	Configure the specified device with the configuration file associated (via SNMP) with that device
getfkey1–getfkey4	None	Displays the current value for the function keys used when online with a device
oc, oosclear	Device	Set the device at specified device In Service
online	Device	Go online with a device to check or set configuration information
oosset, os	Device	Set the specified device Out Of Service
reset, rs	Device	Reset the specified device
setconfig	Pathname Device	Associates a configuration file with a device
setfkey1–setfkey4	Command String	Configures the current function key values for use when online with a device
test	Device	Performs a specific diagnostic test to an indivisual or range of modems
usage	Specifier	Displays how many modems: received or made calls, were OOS, were not responding, or were free

Security

Command Name	Parameters	Description
lo, logout	None	Logs you off of the system so next user has to login to get access
passwd, password	None	Will prompt you for old, new, and new password
security	None	Allows the modification of a subordinate security levels user name and password
userid	None	Will prompt you for old, new, and new user ID
whoami	None	Tells you what user is currently logged in

System

Command Name	Parameters	Description
A:	None	Changes the drive the user is to work with
B:	None	Changes the drive the user is to work with
abort	None	Cancels update procedure of modem and T1 cards
boot	None	Reboot MR9600
bye	None	Logs the user off the system
exit	None	Logs the user off the system
format	Specifier	Initialize the specified drive to empty
history	None	Display command history buffer
quit	None	Logs the user off the system
mount	Specifier	Make the specified drive available to the operating system
readme	None	Display information about most recent changes to firmware
unmount	Specifier	Remove the drive from the operating system

Commands Listed by Security Level

This section lists the MR9600's commands by security level. The security levels are Guest, Operator, and Supervisor.

For an expanded description of each command, see "Command Reference" on page 33.

Guest

Command Name	Parameters	Description
A:	None	Changes the drive the user is to work with
B:	None	Changes the drive the user is to work with
bye	None	Logs the user off the system
cat	Pathname	Display the contents of an ASCII text file
cd, chdir	Pathname	Change to the specified directory
cl, clock	None	Displays current date and time
dir	Pathname	Display the contents of a directory
exit	None	Logs the user off the system
getgateway	None	Display the configured gateway address
getip	None	Display the configured IP address
getpowerstatus, getps	None	Displays the main power supply/supplies status and which segments are powered up
getsendtrap	None	Displays whether traps are being sent or not.
getsubnet	None	Display the configured subnet mask
gettemp	None	Displays the internal ambient temperature of the rack in degrees Fahrenheit and Celcius.
gettrap	None	Display the configured trap address
history	None	Display command history buffer
logout, lo	None	Logs you off of the system so next user has to login to get access.
ls	Pathname	Display the contents of a directory
more	Pathname	Displays the contents of a file, one apge at a time
passwd, password	None	Will prompt you for old, new, and new password
quit	None	Logs the user off the system
security	None	Allows the modification of a subordinate security levels username and password
t1status	Device	Displays the status of a T1 device
type	Pathname	Displays the contents of an ASCII text file
userid	None	Prompts you for old,and new user id
version, ver	None	Displays the version number and release date of the CC9600 Controller's Operating System
whoami	None	Tells you what user is currently logged in

Operator

Command Name	Parameters	Description
abort	None	Cancels update procedure of modem and T1 cards
cfg, configure	Device	Configures the specified device with the configuration file associated (via SNMP) with that device
copy, cp	Pathname1 Pathname2	Copies a file from Pathname1 to Pathname2
date, d	None	Prompts you for current date
getcalls	Device	Displays call traffic for the device
getfaults	Device	Displays faults for the device
getfkey1–getfkey4	None	Displays the current value for the function keys used when online with a device
getmodems	Device	Displays the current status for the device
getrack	None	Displays the model number and basic description of the chassis
getslots	None	Displays hardware type and location in rack
oc, oosclear	Device	Sets the device at specified device In Service
online	Device	Allows the user to perform AT commands with the selected device
oosset, os	Device	Sets the specified device Out Of Service
pristatus	Specifier	Retrieve the current status of the specified PRI card
prisetup	Specifier	Set configuration parameters for a PRI card.
readme	None	Displays information about most recent changes to firmware
reset, rs	Device	Resets the specified device
se, setenviron	None	Conteoller configuration utility (a menu drivin system used to set global defaults and configure system devices)
setconfig	Pathname Device	Associates a configuration file with a device
setfkey1–setfkey4	Command String	Configures the current function key values for use when online with a device
setrasostype	Device	Lets the controller know what operating system is loaded on each segment
sync	None	Writes outstanding events to the Log directory
t1cfg	Device	Sends stored configuration data to T1 device
test	Device	Performs a specific diagnostic test to an indivisual or range of modems
time	None	Prompts you for current time
update	Pathname Device	Updates the firmware of the controller, a T1 device, or a modem
uptime	None	Displays date and time since the last boot

usage	Specifier	Displays how many modems: received or made calls, were OOS, were not responding, or were free

Supervisor

Command Name	Parameters	Description
boot	None	Reboots MR9600
bpstatus	None	Displays the rack's back plane polling activity between the controller and each powered device
del, delete	Pathname	Deletes a file
download	Pathname	Downloads a file from the MR9600 controller
format	Specifier	Initialize the specified drive to empty
getreadcommunity	None	Displays the Read community settings
getwritecommunity	None	Displays the Write community settings
md, mkdir	Pathname	Makes a directory
mount	Specifier	Make the specified drive available to the operating system
rd, remdir	Pathname	Removes directory
ren, rename	Pathname	Renames a file
rendir	Pathname	Renames a directory
rm	Pathname	Deletes a file
setgateway	IP Address	Configures the gateway address
setip	IP Address	Configures the IP address
setpollingoff	Device	Disables the controller generated polling to specified device
setpollingon	Device	Re-enables polling between controller and specified device
setreadcommunity	None	Changes the Read community settings
setsendtrap	On/Off	Changes the status of sending traps
setsubnet	IP Address Mask	Configures the subnet mask
settrap	IP Address	Configures the trap address
setwritecommunity	None	Changes the Write community settings
t1debug	Device	Displays status of AB Signalling bits for both the transmit and receive directions of each DSO channel for the specified T1 device within the CommPlete
t1setup	Device	Configures a T1 device
unmount	Specifier	Remove the drive from the operating system
upload	Pathname	Uploads a file to the MR9600.
userid	None	Changes the login username of the Supervisor

Command Reference

This section describes the MR9600's commands in alphabetic order. For a description of the parameters, see "Parameter Types" on page 24.

?

Parameter: *None*

Description: Displays an alphabetic list of the available commands.

Security: Guest

A:

Parameter: *None*

Description: Changes the drive the user is to work with.

Security: Guest

Example:

```
[01] B:\# A:
[02] A:\#
```

!!

Parameter: *None*

Description: Repeats the last command that has been saved in the history buffer. The command that is executed is then placed into the history buffer at the current command index. A list of previously executed commands can be printed by using the **history** command. See ***history***.

Security: Guest

Example:

```
[0] A:\ # clock
10/29/1996 1:20pm
[1] A:\ # !!
10/29/1996 1:20pm
```

!n

Parameter: *Command history index.*

Description: Repeats the command whose index is indicated by the parameter. The command index is the number shown in the prompt when the command is executed. The command that is executed is then placed into the history buffer at the current command index. A list of previously executed commands can be printed by using the **history** command. See ***history***.

Security: Guest

Example:

```
[0] A:\ # clock
10/29/1996 1:20pm
[1] A:\ # ver
Version E-1.02 (Oct 24 1996 18:06:37)
[2] A:\ # !0
10/29/1996 1:20pm
```

!a

Parameter: The initial characters of the command to search for

Description: Repeats the command whose initial characters are indicated by the parameter. The command that is executed is then placed into the history at the current command index. A list of previously executed commands can be printed by using the **history** command. See ***history***.

Security: Guest

Example:

```
[0] A:\ # clock
10/29/1996 1:20pm
[1] A:\ # ver
Version E-1.02 (Oct 24 1996 18:06:37)
[2] A:\ # !cl
10/29/1996 1:20pm
```

abort

Parameter: *None*

Description: Cancels update procedure of modem and T1 cards

Security: Operator

Example:

```
[03] B:\MMM # Update hd8-100d.hex 3a

Update started

[04] B:\MMM # Abort

Are you sure you wish to abort the update? (y/n) y

Aborting ...

[05]B:\MMM #
```

B:

Parameter: *none*

Description: Changes the drive that the user is to work with

Security: Guest

Example:

```
[01] A:\# B:

[02] B:\#
```

boot

Parameter: *None*

Description: Reboots the system by performing a reset of the MR9600 controller card. A prompt asks you to confirm your choice. If you wish to reboot the system, enter **y**. Any other key will halt the reboot operation.

Security: Supervisor

Example:

```
[0] A:\ # boot

Are you sure you wish to reboot the controller card?
(y/n)
```

bpstatus

Parameter: *None*

Description: Displays the rack's back plane polling activity between the controller and each powered device. Each correctly operating device responds to three specific polls; "Busy", "No Response", and "No Acknowledgement". If the device does not respond the counter/s will increment. The example below shows all devices in a fully loaded CC9600 are responding correctly.

Security: Supervisor

Example:

```
[1] A:\# bpstatus

Backplane Status:              Busy:NoResp:NoAck
-:no polling  0:count of 0     1-9: tens digit plus 1     *:>=ninety
Slot A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P
1:  000 000
2:  000 000 000 000 000 000 000 000
3:  000 000 000 000 000 000 000 000
4:  000 000 000 000 000 000 000 000
5:  000 000
6:  000 000 000 000 000 000 000 000
7:  000 000 000 000 000 000 000 000
8:  000 000 000 000 000 000 000 000
9:  000 000
10: 000 000 000 000 000 000 000 000
11: 000 000 000 000 000 000 000 000
12: 000 000 000 000 000 000 000 000
13: 000 000
14: 000 000 000 000 000 000 000 000
15: 000 000 000 000 000 000 000 000
16: 000 000 000 000 000 000 000 000

[2] A:\ #
```

bye

Parameter: *None*

Description: Logs the User off of the system

Security: Guest

Example:

```
[03] B:\# Bye

Bye

Username:
```

cat

Parameter: *Pathname*

Description: Displays the contents of the ASCII text file referred to by *Pathname*.

Security: Guest

Limitations: The **cat** command is more similar to the DOS **type** command than it is to the UNIX **cat** command.

Example:

```
[0] A:\MMM # cat mr9600.ini

[SecurityFile]
NumberOfFile = 1
1 = mr9600.db

[SecurityConfig]
UseridPrompt = ^m^jUserid:
PasswordPrompt = ^m^jPassword:
WelcomeMsg = ^m^jConnected to MultiCommManager System:^m^j
...
```

cd, chdir

Parameter: *Pathname*

Description: Change directory. The **cd** command sets the current working directory to *Pathname*.

Security: Guest

Example:

```
[0] A:\ # cd mmm

[1] A:\MMM #
```

cfg, configure

Parameter: *Device*

Description: Configure the specified device with the configuration file associated via SNMP with that device. The **cfg** command causes the configuration file associated with the modems specified by *Device* to be sent to them. If the modem is connected, the **cfg** commands will be ignored.

Security: Guest

Example:

```
[0] A:\MMM # cfg 1a,2a:2c

[1] A:\MMM #
```

chdir

See ***cd***.

cl, clock

Parameter: *None*

Description: Displays current date and time (24 hour clock).

Security: Guest

Limitations: The time does not change automatically with daylight savings time.

Example:

```
[0] A:\MMM # cl

4/15/97 1:20pm

[1] A:\MMM #
```

configure

See ***cfg***.

copy, cp

Parameter: *Pathname1 Pathname2*

Description: Copy the file *Pathname1* to *Pathname2*. If *Pathname2* exists, it is destroyed.

Security: Operator

Example:

```
[0] A:\MMM # copy mr9600.ini mr9600.old

[1] A:\MMM #
```

d, date

Parameter: *None*

Description: Displays the MR9600's current date and prompts you for a new date.

Security: Operator

Example:

```
[0] A:\MMM # d

The current date is: 5/15/1996
Enter the new date: mm/dd/yyyy 10/29/96

[1] A:\MMM # cl

10/29/96 1:37pm
```

del, delete, rm

Parameter: *Pathname*

Description: Deletes the file specified by *Pathname*. The file is permanently destroyed, and cannot be recovered.

Security: Supervisor

Example:

```
[0] A:\MMM # del mr9600.old

[1] A:\MMM #
```

dir, ls

Parameter: *Pathname* or *none*

Description: The **dir** and **ls** commands display the contents of the current directory by file name, file size, and date; they also show the available space on the drive. If no parameter is used, the **dir** and **ls** commands list only the files of the current directory.

Security: Guest

Limitations: The output of the **ls** command is more similar to that of the DOS **dir** command than it is to that of the UNIX **ls** command.

Example:

```
[0] A:\MMM # dir

The current directory is 'A:\MMM'

.. <DIR>
...<DIR>
MR9600.INI       965    12/19/1996  2:53pm
MR9600.GP        4155   12/18/1996  4:54pm
MR9600.CNF       12221  12/19/1996 11:22am
MR9600.INV       3812   12/19/1996  2:54pm
MR9600.DB        792    12/19/1996  2:56pm
DEFAULT.CFG      0      12/18/1996  1:56pm
MR9600.SAV       192    12/18/1996 11:56am
MR.LOG <DIR>            11/25/1996  3:50pm
7 file(s) 22137 bytes
3 dirs(s) 1015296 bytes free

[1] A:\MMM #
```

download

Parameter: *Pathname*

Description: Downloads the file specified by *pathname* from the MR9600 to a computer connected to the MR9600 controller's serial port connector on the back of the CC9600 chassis. The files are downloaded as hexadecimal values in ASCII text format.

Note: For debugging use only under the direction of technical support personnel. Files will normally be transferred using FTP.

Security: Supervisor

Limitations: The file transfer does not respond to flow control.

Example:

```
[0] A:\MMM # download mr9600.old
[5b] [46] [61] [75] [6c] [74] [41] [6c] [61] [72] [6d] [73] [5d] [0d] [0a] [43]
[61] [72] [64] [20] [49] [6e] [73] [74] [61] [6c] [6c] [65] [64] [20] [3d] [20]
[4f] [4e] [2c] [30] [2c] [4e] [4f] [4e] [45] [0d] [0a] [43] [61] [72] [64] [20]
[52] [65] [6d] [6f] [76] [65] [64] [20] [3d] [20] [4f] [4e] [2c] [30] [2c] [4e]
[4f] [4e] [45] [0d] [0a] [50] [6f] [77] [65] [72] [20] [53] [75] [70] [70] [6c]
[79] [20] [46] [61] [69] [6c] [75] [72] [65] [20] [3d] [20] [4f] [4e] [2c] [30]
[2c] [4e] [4f] [4e] [45] [0d] [0a] [44] [69] [73] [63] [6f] [6e] [6e] [65] [63]
[74] [3a] [20] [50] [6f] [77] [65] [72] [4f] [6e] [20] [6f] [72] [20] [57] [61]
[74] [63] [68] [44] [6f] [67] [20] [3d] [20] [4f] [4e] [2c] [30] [2c] [4f] [4f]
...
[1] A:\MMM #
```

exit

Parameter: *None*

Description: Logs the User off of the system.

Security: Guest

Example:

```
[01] A:\# exit

Bye.

Username:
```

format

Parameter: *Specifier*

Description: Initialize the specified drive to empty. All data is erased.

Security: Supervisor

Example:

```
[01] A:\# format b:

[02] B:\#
```

getcalls

Parameter: *Device* or *none*

Description: Displays call traffic for the modems listed in *device*. If there is no parameter, call traffic is listed for every installed modem.

Security: Supervisor

Example:

```
[0] A:\ #
[1] A:\ # getcalls

Modem   DateTime    Connect Info.          Call Duration  User ID  Phone Number

1A  No Calls
1B  No Calls
1C  05-21 08:15:02 A-33600-V.42bis        000-00:00:08
1C  05-21 08:15:41 A-33600-V.42bis        000-00:00:08
1C  05-21 08:32:58 A-33600-V.42bis        000-00:00:09
2A  05-21 08:13:48 O-33600-V.42bis        000-00:00:08            DT13
2A  05-21 08:14:26 O-33600-V.42bis        000-00:00:09            DT13
2A  05-21 08:15:02 O-33600-V.42bis        000-00:00:08            DT13
2A  05-21 08:16:20 O-33600-V.42bis        000-00:00:08            DT13
2A  05-21 08:33:02 Originate              Open Call               DT13
2B  05-21 08:13:47 O-33600-V.42bis        000-00:00:08            DT16

...

[2] A:\ #
```

getfaults

Parameter: *Device* or *none*

Description: Displays faults for the modems listed in *device*. If there is no parameter, faults are listed for every installed modem.

Security: Operator

Example:

```
[0] A:\ # getfaults

Modem  Date   Time      Fault Description

1   06-05  10:18:51     Rack Online
    06-05  10:19:17     Remote management session initiated
11  06-05  10:19:26     Modem card Removed
7   06-05  10:19:31     Modem card Removed
8   06-05  10:19:46     Modem card Installed

[1] A:\ #
[2] A:\ # getfaults 3a:3c

3A        No fault/status found
3B  05-21  08:27:1      Modem reset by rack controller card
3C        No fault/status found

[3] A:\ #
```

getfkey1, getfkey2, getfkey3, getfkey4

Parameter: *None*

Description: Displays the current configuration for the specified online function key. These function keys can be used when one is online with a modem. *See **online**.*

Security: Operator

Example:

```
[0] A:\ # getfkey1

Function Key 1: 'ATL5'

[1] A:\ # getfkey2

Function Key 2: 'ATL6'

[2] A:\ # getfkey3

Function Key 3: 'ATL5L6L7'

[3] A:\ # getfkey4

Function Key 4: 'ATI1I2I3I4'
```

getgateway

Parameter: *None*

Description: Displays the default gateway IP address for the MR9600, if one is set.

Security: Guest

Example:

```
[0] A:\MMM # getgateway

Gateway IP Address = 199.199.99.1

[1] A:\MMM #
```

getip

Parameter: *None*

Description: Displays the MR9600's IP address.

Security: Guest

Example:

```
[0] A:\MMM # getip

IP Address = 199.199.99.9

[1] A:\MMM #
```

getmodems

Parameter: *Device* or *none*

Description: Displays the current status for the modems specified by *device*. If there is no parameter, current status is displayed for every installed modem.

Security: Operator

Example:

```
[0] A:\ # getmodems

Modem  Current State    Config Filename     Modem Group Name    Modem
Inventory

1A Idle   default.cfg  Group1 Dial Up No Security
1B Idle   default.cfg  Group1 Dial Up No Security
1C Idle   default.cfg  Group1 Dial Up No Security
2A Idle   default.cfg  Group1 Dial Up Call In Security
2B Dial   default.cfg  Group1 Dial Up Call In Security
2C Ring   default.cfg  Group1 Dial Up Call In Security
3A Dial   default.cfg  Group1 Dial Up Callback Security
3B Ring   default.cfg  Group1 Dial Up Callback Security
3C Idle   default.cfg  Unassigned   Dial Up Callback Security
4A Idle   default.cfg  Group1 Dial Up No Security
4B Idle   default.cfg  Unassigned   Dial Up No Security
4C Idle   default.cfg  Group1 Dial Up No Security
[1] A:\ #
[2] A:\ # getmodems 4a:5c

4A Idle   default.cfg  Group1 Dial Up No Security
4B Idle   default.cfg  Unassigned   Dial Up No Security
4C Idle   default.cfg  Group1 Dial Up No Security
5A Not Present  default.cfg  Unassigned   Dial Up No Security
5B Not Present  default.cfg  Unassigned   Dial Up No Security
5C Not Present  default.cfg  Unassigned   Dial Up No Security

[3] A:\ #
```

getprichannels

Parameter: *Device*

Description: Displays the current status of each of the B-channels and modem channels under the control of the PRI card.

Security: Supervisor

Example:

```
getprichannels 2a

getting PRI Info
Bchannels
Chan 01: Ready   Chan 02: Ready
Chan 03: Ready   Chan 04: Ready
Chan 05: Ready   Chan 06: Ready
Chan 07: Ready   Chan 08: Ready
Chan 09: Ready   Chan 10: Ready
Chan 11: Ready   Chan 12: Ready
Chan 13: Ready   Chan 14: Ready
Chan 15: Ready   Chan 16: Ready
Chan 17: Ready   Chan 18: Ready
Chan 19: Ready   Chan 20: Ready
```

```
Chan 21: Ready   Chan 22: Ready
Chan 23: Ready   Chan 24: Ready
Chan 25: Ready   Chan 26: Ready
Chan 27: Ready   Chan 28: Ready
Chan 29: Ready   Chan 30: Ready

Modem Channels (card 1)
Chan 01 (3A): Idle      Chan 02 (3B): Idle
Chan 03 (3C): Idle      Chan 04 (3D): Idle
Chan 05 (3E): Idle      Chan 06 (3F): Idle
Chan 07 (3G): Idle      Chan 08 (3H): Idle
Chan 09 (3I): Idle      Chan 10 (3J): Idle
Chan 11 (3K): Idle      Chan 12 (3L): Idle
Chan 13 (3M): Idle      Chan 14 (3N): Idle
Chan 15 (3O): Idle      Chan 16 (3P): Idle

Modem Channels (card 2)
Chan 01 (4A): Idle      Chan 02 (4B): Idle
Chan 03 (4C): Idle      Chan 04 (4D): Idle
Chan 05 (4E): Idle      Chan 06 (4F): Idle
Chan 07 (4G): Idle      Chan 08 (4H): Idle
Chan 09 (4I): Idle      Chan 10 (4J): Idle
Chan 11 (4K): Idle      Chan 12 (4L): Idle
Chan 13 (4M): Idle      Chan 14 (4N): Idle
Chan 15 (4O): Idle      Chan 16 (4P): Idle
```

getps, getpowerstatus

Parameter: *None*

Description: Displays the main power supply (or supplies) status and which segments are powered up.

Security: Guest

Example:

```
[02] A:\ # getpowerstatus

Left Power Supply:      Installed, All outputs good
Right Power Supply:     Installed, All outputs good

First Segment:   Powered
Second Segment:  Not Powered
Third Segment:   Not Powered
Fourth Segment:  Not Powered

[03] A:\ #
```

gettemp

Parameter: *None*

Description: Displays the internal ambient temperature of the rack in Fahrenheit and Celsius.

Security: Guest

Limitations: CC9600 Only

Example:

```
[03] A:\ # gettemp

76.4 degrees Fahrenheit
24.7 degrees Celsius
```

getrack

Parameter: *None*

Description: Displays the current Rack Type.

Security: Supervisor

Example:

```
getrack
Chassis Type: CC2400 single segment chassis
[2] A:\ #
```

getreadcommunity

Parameter: *None*

Description: Displays the Read community settings.

Security: Supervisor

Example:

```
[0] A:\MMM # getreadcommunity

Read community = public
Enter SETREADCOMMUNITY <community-string> to change it.

[1] A:\ #
```

getsendtrap

Parameter: *None*

Description: Displays whether or not traps are being sent from the MR9600. See ***setsendtrap***.

Security: Guest

Example:

```
[0] A:\ # getsendtrap

The sending of traps is enabled.

[1] A:\ # setsendtrap off

The sending of traps has been successfully disabled.

[2] A:\ # getsendtrap

The sending of traps is disabled.
```

getslots

Parameter: *None*

Description: Displays hardware type and location within the rack. This command also displays the number of devices in each slot.

Security: Operator

Example:

```
[0] A:\ # getslots

1   MTRAS96-T1A   2
2   MT5634HD8     8
3   MT5634HD8     8
4   MT5634HD8     8
```

getsubnet

Parameter: *None*

Description: Displays the subnet mask for the MR9600.

Security: Guest

Example:

```
[0] A:\MMM # getsubnet

Subnet mask = 255.255.255.0

[1] A:\MMM #
```

gettrap

Parameter: *None*

Description: Displays the default trap IP address for the MR9600, if one is set. This is the address to which MR9600-generated traps, such as fault and status traps, are sent.

Security: Guest

Example:

```
[0] A:\MMM # gettrap

Trap IP Address = 199.199.99.91

[1] A:\MMM #
```

getwritecommunity

Parameter: *None*

Description: Displays the Write community settings.

Security: Supervisor

Example:

```
[0] A:\MMM # getwritecommunity

Write community = public
Enter SETWRITECOMMUNITY <community-string> to change it.

[1] A:\MMM #
```

history

Parameter: *None*

Description: Displays the command history buffer.

Security: Guest

Example:

```
[4] A:\ # history

   0 VER

   1 CLOCK

   2 VER

   3 CLOCK

   4 HISTORY

[5] A:\ #
```

lo, logout

Parameter: *None*

Description: The **logout** command ends the session for the current user, and displays the **`userid`** prompt on the monitor.

Security: Guest

Example:

```
[0] A:\MMM # lo

Bye.
UserName:
```

ls

See ***dir***.

md, mkdir

Parameter: *Pathname*

Description: Make directory. The **md** command creates a directory with the path and file name assigned by the *pathname* parameter.

Security: Supervisor

Example:

```
[0] A:\MMM # md mr.log
[1] A:\MMM # cd mr.log
[2] A:\MMM\MR.LOG #
```

more

Parameter: *Filename or Path*

Description: Displays the contents of a file, one page at a time. The user may press any key to continue, or type the letter Q to quit.

Security: Guest

Example:

```
[04] A:\MMM # more mr4800.ini

[SecurityConfig]
UseridPrompt = ^m^jUserid:
PasswordPrompt = ^m^jPassword:
.
.
.
[SecurityFile]
NumberOfFile=0
[NetWorkDefaults]
Default Gateway = 192.168.10.151
--More--
```

mount

Parameter: *Specifier*

Description: Make the specified drive available to the operating system.

Security: Supervisor

Example:

```
[01] [No Drive Mounted] # mount a:

[02] A:\ #
```

oc, oosclear, oosclr

Parameter: *Device*

Description: Puts the specified devices in service by clearing the Out Of Service flag.

Security: Operator

Limitations: There is no effect if the Out Of Service flag is not set for the modems.

Example:

```
[0] A:\MMM # oc 1a

[1] A:\MMM #
```

online

Parameter: *Device*

Description: Goes online in command mode with a device to check configuration information and firmware version information. This does not create a fully functional terminal, but is available to set and check configuration information.

Security: Operator

Example:

```
[0] A:\ # online 6a:6c

==== Online with device: Slot 06 Device A      ====

==== type "<esc> and ?" to display help information ====

<esc>?

+--------------------------------------+

! <esc> again to exit terminal mode    !

! b   to move back in device list      !

! c   to clear the screen              !

! n   to move forward in device list   !

! 1   send stored command 1 to device  !

! 2   send stored command 2 to device  !

! 3   send stored command 3 to device  !

! 4   send stored command 4 to device  !

! ?   to display this help menu        !

+--------------------------------------+

atl5

B1 E1 M1 Q0 R0 V1 X4 &E1 &E4 &E6 &E8 &E10 &E13 &E15 %C0 #C1 *C0
&C1 *H0

$MB33600 $SB115200 $BA0 &W1
```

```
OK

<esc>n

==== Current device is: Slot 6 Device B ====

at!5
B1 E1 M1 Q0 R0 V1 X4 &E1 &E4 &E6 &E8 &E10 &E13 &E15 %C0 #C1 *C0
&C1 *H0

$MB28800 $SB57600 $BA0 &W1

OK

<esc>n

==== At end of list: Slot 6 Device C ====

at!5
B1 E1 M1 Q0 R0 V1 X4 &E1 &E4 &E6 &E8 &E10 &E13 &E15 %C0 #C1 *C0
&C1 *H0

$MB28800 $SB57600 $BA0 &W1

OK

<esc>b

==== Current device is: Slot 6 Device B ====

<esc><esc>

Goodbye!

[1] A:\ #
```

oosset, os

Parameter: *Device*

Description: Sets the Out Of Service flag for the modems specified by *device*.

Security: Operator

Limitations: If the modems are connected when the command is issued, they will remain off hook when the call is completed.

Example:

```
[0] A:\MMM # os 1a

[1] A:\MMM #
```

passwd, password

Parameter: *None*

Description: The **passwd** command allows you to change your password by prompting you for the current password and a new password.

Security: Guest

Example:

```
[0] A:\MMM # passwd

Current password: *****
New password: *****
Repeat new password: *****

Security information updated

[1] A:\MMM #
```

priosbchannels

Parameter: <*device*>.<*channel*>

Description: Sets the specified channel out of service

Security: Supervisior

Example:

```
[03] A:\# priosbchannel 2a.1

[04] A:\# getprichannels 2a

getting PRI Info
Bchannels
Chan 01: OOS     Chan 02: Ready
Chan 03: Ready   Chan 04: Ready
Chan 05: Ready   Chan 06: Ready
Chan 07: Ready   Chan 08: Ready
Chan 09: Ready   Chan 10: Ready
Chan 11: Ready   Chan 12: Ready
Chan 13: Ready   Chan 14: Ready
Chan 15: Ready   Chan 16: Ready
Chan 17: Ready   Chan 18: Ready
Chan 19: Ready   Chan 20: Ready
Chan 21: Ready   Chan 22: Ready
Chan 23: Ready   Chan 24: Ready
Chan 25: Ready   Chan 26: Ready
Chan 27: Ready   Chan 28: Ready
Chan 29: Ready   Chan 30: Ready

Modem Channels (card 1)
Chan 01 (3A): Idle     Chan 02 (3B): Idle
Chan 03 (3C): Idle     Chan 04 (3D): Idle
Chan 05 (3E): Idle     Chan 06 (3F): Idle
Chan 07 (3G): Idle     Chan 08 (3H): Idle
Chan 09 (3I): Idle     Chan 10 (3J): Idle
Chan 11 (3K): Idle     Chan 12 (3L): Idle
Chan 13 (3M): Idle     Chan 14 (3N): Idle
Chan 15 (3O): Idle     Chan 16 (3P): Idle

Modem Channels (card 2)
Chan 01 (4A): Idle     Chan 02 (4B): Idle
Chan 03 (4C): Idle     Chan 04 (4D): Idle
```

```
Chan 05 (4E): Idle      Chan 06 (4F): Idle
Chan 07 (4G): Idle      Chan 08 (4H): Idle
Chan 09 (4I): Idle      Chan 10 (4J): Idle
Chan 11 (4K): Idle      Chan 12 (4L): Idle
Chan 13 (4M): Idle      Chan 14 (4N): Idle
Chan 15 (4O): Idle      Chan 16 (4P): Idle

[05] A:\#
```

priocbchannels

Parameter: <*device*>.<*channel*>

Description: Sets the specified channel in service

Security: Supervisior

Example:

```
[03] A:\# priocbchannel 2a.1

[04] A:\# getprichannels 2a

getting PRI Info
Bchannels
Chan 01: Ready   Chan 02: Ready
Chan 03: Ready   Chan 04: Ready
Chan 05: Ready   Chan 06: Ready
Chan 07: Ready   Chan 08: Ready
Chan 09: Ready   Chan 10: Ready
Chan 11: Ready   Chan 12: Ready
Chan 13: Ready   Chan 14: Ready
Chan 15: Ready   Chan 16: Ready
Chan 17: Ready   Chan 18: Ready
Chan 19: Ready   Chan 20: Ready
Chan 21: Ready   Chan 22: Ready
Chan 23: Ready   Chan 24: Ready
Chan 25: Ready   Chan 26: Ready
Chan 27: Ready   Chan 28: Ready
Chan 29: Ready   Chan 30: Ready

Modem Channels (card 1)
Chan 01 (3A): Idle      Chan 02 (3B): Idle
Chan 03 (3C): Idle      Chan 04 (3D): Idle
Chan 05 (3E): Idle      Chan 06 (3F): Idle
Chan 07 (3G): Idle      Chan 08 (3H): Idle
Chan 09 (3I): Idle      Chan 10 (3J): Idle
Chan 11 (3K): Idle      Chan 12 (3L): Idle
Chan 13 (3M): Idle      Chan 14 (3N): Idle
Chan 15 (3O): Idle      Chan 16 (3P): Idle

Modem Channels (card 2)
Chan 01 (4A): Idle      Chan 02 (4B): Idle
Chan 03 (4C): Idle      Chan 04 (4D): Idle
Chan 05 (4E): Idle      Chan 06 (4F): Idle
Chan 07 (4G): Idle      Chan 08 (4H): Idle
Chan 09 (4I): Idle      Chan 10 (4J): Idle
Chan 11 (4K): Idle      Chan 12 (4L): Idle
Chan 13 (4M): Idle      Chan 14 (4N): Idle
Chan 15 (4O): Idle      Chan 16 (4P): Idle

[05] A:\#
```

prisetup

Parameter: *Specifier*

Description: Set Configuration parameters for a PRI card.

Security: Operator

Example:

```
[01] A:\# prisetup 2a
```

pristatus

Parameter: *Specifier*

Description: Retrieve the current status of the specified PRI card

Security: Operator

Example:

```
[01] A:\# pristatus 2a
```

quit

Parameter: *None*

Description: Logs the User off of the system.

Security: Guest

Example:

```
[05] A:\ # quit

Bye.

Username:
```

readme

Parameter: *None*

Description: Displays a summary of the most recent modifications made to the firmware for the MR9600.

Security: Operator

Example:

```
[0] A:\ # readme
MR9600 version 1.02 release information
-- 1. Web Server functionality --------
. . .
-- 2. MR9600 MIB --------
. . .
-- 3. Known Limitations --------
. . .

[1] A:\ #
```

rd, remdir

Parameter: *Pathname*

Description: Remove directory. The **rd** command deletes the directory specified by *pathname*.

Security: Supervisor

Limitations: The directory must be empty before **rd** can delete it. The **rd** command cannot delete a directory's subdirectories.

Example:

```
[0] A:\MMM # rd mr.log
[1] A:\MMM #
```

ren, rename

Parameter: *Pathname1 Pathname2*

Description: Renames the file *Pathname1* to *Pathname2*.

Security: Supervisor

Example:

```
[0] A:\ # ren temp.txt temp1.txt
[1] A:\ #
```

rendir

Parameter: *Pathname1 Pathname2*

Description: Renames the directory *Pathname1* to *Pathname2*.

Security: Supervisor

Example:

```
[0] A:\ # rendir MMM MMM1
[1] A:\ #
```

reset, rs

Parameter: *Device*

Description: Resets the specified modems by cycling their power. Any modems that are connected will disconnect.

Security: Operator

Example:

```
[0] A:\ # reset 1a
[1] A:\ #
```

rm

*See **del**.*

rs

*See **reset**.*

se, setenviron

Parameter: *None*

Description: Allows you to check or change the environment values for the MR9600. The IP address, default trap IP, gateway IP, subnet mask, and community strings may all be changed.

Security: Supervisor

Example:

```
Username: supervisor

Password: **********
Welcome to the MultiCommManager
1.99 Beta

[0] A:\ # se

Getting System Defaults

MultiCommManager Environment Setup

   1. System Defaults Setup
   2. Device Specific Setup

Enter Selection (<1>,2, q, -):

System Defaults Setup

   1. Network Defaults
   2. Ras Defaults
   3. Ras Security Defaults
   4. T1 Defaults

Enter Selection (<1>,2,3,4, q, -):  1

          Default Gateway:0.0.0.0
              Subnet Mask:0.0.0.0
       Primary DNS Server:0.0.0.0
        Backup DNS Server:0.0.0.0

Default Gateway (<0.0.0.0>, q, -):
Subnet Mask (<0.0.0.0>, q, -):
Primary DNS Server (<0.0.0.0>, q, -):
Backup DNS Server (<0.0.0.0>, q, -):
System Defaults Setup

   1. Network Defaults
   2. Ras Defaults
   3. Ras Security Defaults
   4. T1 Defaults

Enter Selection (1,<2>,3,4, q, -):  2

         Operating System:Ras Express pre(5.2)
               Frame Type:TYPE_II
           Address Method:Per port config
            Wan Port IPCP:Disabled

Operating System
   1. Ras Express pre(5.2)
   2. SCO Unix
   3. Windows NT
   4. Novell Netware
   5. Ras Express 5.2 (or later)
   6. Other
```

```
Enter Selection (<1>,2,3,4,5,6, q, -):  5
Frame Type

   1. TYPE_II
   2. SNAP

Enter Selection (<1>,2, q, -):
Address Method

   1. via DHCP server
   2. Address pool
   3. Per port config
   4. RADIUS

Enter Selection (1,2,<3>,4, q, -):
Wan Port IPCP

   1. Disabled
   2. Enabled

Enter Selection (<1>,2, q, -):
System Defaults Setup

   1. Network Defaults
   2. Ras Defaults
   3. Ras Security Defaults
   4. T1 Defaults

Enter Selection (1,<2>,3,4, q, -):  3

   Administrator Password:********
                 Protocol:Local
           Primary Server:0.0.0.0
         Secondary Server:0.0.0.0
   Shared Secret Password:********

Administrator Password (<********>, q, -):
Protocol

   1. Local
   2. RADIUS
   3. TACACS+

Enter Selection (<1>,2,3, q, -):
Primary Server (<0.0.0.0>, q, -):
Secondary Server (<0.0.0.0>, q, -):
Shared Secret Password (<********>, q, -):
System Defaults Setup

   1. Network Defaults
   2. Ras Defaults
   3. Ras Security Defaults
   4. T1 Defaults

Enter Selection (1,2,3,<4>, q, -):  4

           Framing Format:DS1 AT&T Extended Super Frame (ESF)
              Line Coding:Binary 8 Zero Substitution (B8ZS)
    FXS Signaling Options:E&M Wink Start
           Transmit Level:- 0.0dB

Framing Format

   1. DS1 AT&T Extended Super Frame (ESF)
   2. AT&T D4 Super Frame (SF)
   3. ANSI Extended Super Frame
   4. G.704.ITU-T section 2.1.3.2
   5. G.704.ITU-T section 2.1.3.1

Enter Selection (<1>,2,3,4,5, q, -):
Line Coding
```

```
   1. Binary 8 Zero Substitution (B8ZS)
   2. Alternate Mark Inversion (AMI)
   3. ZBTSI

Enter Selection (<1>,2,3, q, -):
FXS Signaling Options

   1. E&M Wink Start
   2. E&M Immediate Start
   3. Ground Start
   4. Loop Start

Enter Selection (<1>,2,3,4, q, -):
Transmit Level

   1. - 0.0dB
   2. - 7.5dB
   3. -15.0dB
   4. -22.5dB

Enter Selection (<1>,2,3,4, q, -):
MultiCommManager Environment Setup

   1. System Defaults Setup
   2. Device Specific Setup

Enter Selection (1,<2>, q, -):  2

Device Specific Setup

   1. Controller Setup
   2. Ras Setup
   3. T1 Setup

Enter Selection (<1>,2,3, q, -):  1

               IP Address:192.168.90.3
                     Date:11/10/1997
                     Time:4:31am
          Default Trap IP:192.168.90.5
          Default Gateway:192.168.90.1
              Subnet Mask:255.255.255.0
           Read Community:********
          Write Community:********

IP Address (<192.168.90.3>, q, -):
Date (<11/10/1997>, q, -):
Time (<4:31am>, q, -):  4:31pm
Default Trap IP (<192.168.90.5>, q, -):
Default Gateway (<192.168.90.1>, q, -):
Subnet Mask (<255.255.255.0>, q, -):
Read Community (<********>, q, -):
Write Community (<********>, q, -):
               IP Address:192.168.90.3
                     Date:11/10/1997
                     Time:4:31pm
          Default Trap IP:192.168.90.5
          Default Gateway:192.168.90.1
              Subnet Mask:255.255.255.0
           Read Community:********
          Write Community:********

Config CONTROLLER? (<y>, n):  y

IP Address 192.168.90.3 stored
Trap IP Address 192.168.90.5 stored
Gateway IP Address 192.168.90.1 stored
Subnet mask 255.255.255.0 stored
Read Community public stored
Write Community public stored
Device Specific Setup
```

```
   1. Controller Setup
   2. Ras Setup
   3. T1 Setup

Enter Selection (1,<2>,3, q, -):  2
Configure a Ras Card (1A, <->): 1a

         Operating System:Ras Express 5.2 (or later)

Operating System

   1. Ras Express pre(5.2)
   2. SCO Unix
   3. Windows NT
   4. Novell Netware
   5. Ras Express 5.2 (or later)
   6. Other

Enter Selection (1,2,3,4,<5>,6, q, -):

Getting Ras Info ..

               IP Address:192.168.90.4
              Subnet Mask:255.255.255.0
          Default Gateway:192.168.90.1
        Primary DNS Server:0.0.0.0
         Backup DNS Server:0.0.0.0
                Frame Type:TYPE_II
           Address Method:Address pool

IP Address (<192.168.90.4>, q, -):
Subnet Mask (<255.255.255.0>, q, -):
Default Gateway (<192.168.90.1>, q, -):
Primary DNS Server (<0.0.0.0>, q, -):
Backup DNS Server (<0.0.0.0>, q, -):
Frame Type

   1. TYPE_II
   2. SNAP

Enter Selection (<1>,2, q, -):
Address Method

   1. via DHCP server
   2. Address pool
   3. Per port config
   4. RADIUS

Enter Selection (1,<2>,3,4, q, -):

   Administrator Password:********
                 Protocol:Local
           Primary Server:0.0.0.0
         Secondary Server:0.0.0.0
   Shared Secret Password:********

Administrator Password (<********>, q, -):
Protocol

   1. Local
   2. RADIUS
   3. TACACS+

Enter Selection (<1>,2,3, q, -):
Primary Server (<0.0.0.0>, q, -):
Secondary Server (<0.0.0.0>, q, -):
Shared Secret Password (<********>, q, -):

       Address Pool Start:192.168.90.10
         Address Pool End:192.168.90.33
      Start 1st Exclusion:0.0.0.0
        End 1st Exclusion:0.0.0.0
```

```
      Start 2nd Exclusion:0.0.0.0
        End 2nd Exclusion:0.0.0.0

Address Pool Start (<192.168.90.10>, q, -):
Address Pool End (<192.168.90.33>, q, -):
Start 1st Exclusion (<0.0.0.0>, q, -):
End 1st Exclusion (<0.0.0.0>, q, -):
Start 2nd Exclusion (<0.0.0.0>, q, -):
End 2nd Exclusion (<0.0.0.0>, q, -):
              IP Address:192.168.90.4
             Subnet Mask:255.255.255.0
         Default Gateway:192.168.90.1
       Primary DNS Server:0.0.0.0
        Backup DNS Server:0.0.0.0
               Frame Type:TYPE_II
           Address Method:Address pool
       Address Pool Start:192.168.90.10
         Address Pool End:192.168.90.33
      Start 1st Exclusion:0.0.0.0
        End 1st Exclusion:0.0.0.0
      Start 2nd Exclusion:0.0.0.0
        End 2nd Exclusion:0.0.0.0

   Administrator Password:********
                 Protocol:Local
          Primary Server:0.0.0.0
        Secondary Server:0.0.0.0
   Shared Secret Password:********


Config Ras? (<y>, n): n

Settings have not been changed
Configure a Ras Card (1A, <->):

Device Specific Setup

   1. Controller Setup
   2. Ras Setup
   3. T1 Setup

Enter Selection (1,2,<3>, q, -):  3
Configure a T1 Card (1B, <->): 1b


           Framing Format:DS1 AT&T Extended Super Frame (ESF)
              Line Coding:Binary 8 Zero Substitution (B8ZS)
    FXS Signaling Options:E&M Wink Start
           Transmit Level:- 0.0dB

Framing Format

   1. DS1 AT&T Extended Super Frame (ESF)
   2. AT&T D4 Super Frame (SF)
   3. ANSI Extended Super Frame
   4. G.704.ITU-T section 2.1.3.2
   5. G.704.ITU-T section 2.1.3.1

Enter Selection (<1>,2,3,4,5, q, -):
Line Coding

   1. Binary 8 Zero Substitution (B8ZS)
   2. Alternate Mark Inversion (AMI)
   3. ZBTSI

Enter Selection (<1>,2,3, q, -):
FXS Signaling Options

   1. E&M Wink Start
   2. E&M Immediate Start
   3. Ground Start
   4. Loop Start
```

```
Enter Selection (<1>,2,3,4, q, -):
Transmit Level

   1. - 0.0dB
   2. - 7.5dB
   3. -15.0dB
   4. -22.5dB

Enter Selection (<1>,2,3,4, q, -):
           Framing Format:DS1 AT&T Extended Super Frame (ESF)
              Line Coding:Binary 8 Zero Substitution (B8ZS)
    FXS Signaling Options:E&M Wink Start
           Transmit Level:- 0.0dB


Save changes and config the T1? (<y>, n): n

Settings have not been changed
Configure a T1 Card (1B, <->):


[1] A:\ #
```

security

Parameter: *None*

Description: Prompts you to change the user ID and password for any security levels lower than your own.

Security: Supervisor

Example:

```
[0] A:\MMM # security

Modify security information for which security level:

1. Guest level
2. Operator level
3. Supervisor level

Which one? 1
Enter User ID : guest
Enter new password : *****
Repeat new password : *****
Security information updated

[1] A:\MMM #
```

setconfig

Parameter: *Pathname Device*

Description: Associates a configuration file with a particular modem or modems .

Security: Operator

Example:

```
[0] A:\ # getmodems
2A Idle   default.cfg         Unassigned      Dial Up No Security
2B Idle   default.cfg         Unassigned      Dial Up No Security
2C Idle   default.cfg         Unassigned      Dial Up No Security
4A Idle   default.cfg         Unassigned      Dial Up No Security
4B Idle   default.cfg         Unassigned      Dial Up No Security
4C Idle   default.cfg         Unassigned      Dial Up No Security
[1] A:\ # setconfig unix.cfg 2a:2c
[2] A:\ # setconfig rsa.cfg 4a:4c
[3] A:\ # getmodems
2A Idle   unix.cfg            Unassigned      Dial Up No Security
2B Idle   unix.cfg            Unassigned      Dial Up No Security
2C Idle   unix.cfg            Unassigned      Dial Up No Security
4A Idle   rsa.cfg             Unassigned      Dial Up No Security
4B Idle   rsa.cfg             Unassigned      Dial Up No Security
4C Idle   rsa.cfg             Unassigned      Dial Up No Security
```

setfkey1, setfkey2, setfkey3, setfkey4

Parameter: *Command String*

Description: Creates command macros for the online function keys. These function keys are available for use when one is online with a modem. See ***online***.

Security: Operator

Example:

```
[0] A:\ # getfkey1

Function Key 1: "ATL5"

[1] A:\ # setfkey1 ATL5L6L7

Function Key 1: "ATL5L6L7"

[2] A:\ # getfkey1

Function Key 1: "ATL5L6L7"
```

setgateway

Parameter: *IP Address*

Description: Changes the default gateway address to the one specified by the *IP Address* parameter. *See **se**.*

Security: Supervisor

Example:

```
[0] A:\ # setgateway 199.199.199.191

Gateway IP Address 199.199.199.191 stored

[1] A:\ #
```

setip

Parameter: *IP Address*

Description: Changes the MR9600's IP address to the one specified by the *IP Address* parameter. *See **se**.*

Security: Supervisor

Example:

```
[0] A:\ # setip 199.199.199.44

IP Address 199.199.199.44 stored

[1] A:\ #
```

setpollingoff

Parameter: *Device*

Description: Disables controller generated polling to specified device. The example below starts with displaying the status of the back plane by using the ***bpstatus*** command.

Security: Supervisor

Example:

```
[1] A:\ # bpstatus

Backplane Status:              Busy:NoResp:NoAck
-:no polling 0:count of 0     1-9: tens digit plus 1     *:>=ninety
Slot A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P
5:  000 000
6:  000 000 000 000 000 000 000 000
7:  000 000 000 000 000 000 000 000
8:  000 000 000 000 000 000 000 000
9:  000 000
10: 000 000 000 000 000 000 000 000
11: 000 000 000 000 000 000 000 000
12: 000 000 000 000 000 000 000 000

[2] A:\# setpollingoff 5a

[3] A:\# bpstatus

Backplane Status:              Busy:NoResp:NoAck
-:no polling 0:count of 0     1-9: tens digit plus 1     *:>=ninety
Slot A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P
5:  --- 000
6:  000 000 000 000 000 000 000 000
7:  000 000 000 000 000 000 000 000
8:  000 000 000 000 000 000 000 000
9:  000 000
10: 000 000 000 000 000 000 000 000
11: 000 000 000 000 000 000 000 000
12: 000 000 000 000 000 000 000 000
```

setpollingon

Parameter: *Device*

Description: Re-enables polling bewtween controller and specified device. The example below starts with displaying the status of the back plane by using the ***bpstatus*** command.

Security: Supervisor

Example:

```
[4] A:\ # bpstatus

Backplane Status:              Busy:NoResp:NoAck
-:no polling 0:count of 0      1-9: tens digit plus 1     *:>=ninety
Slot A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P
5:  --- 000
6:  000 000 000 000 000 000 000 000
7:  000 000 000 000 000 000 000 000
8:  000 000 000 000 000 000 000 000
9:  000 000
10: 000 000 000 000 000 000 000 000
11: 000 000 000 000 000 000 000 000
12: 000 000 000 000 000 000 000 000

[5] A:\# setpollingon 5a

[6] A:\# bpstatus

Backplane Status:              Busy:NoResp:NoAck
-:no polling 0:count of 0      1-9: tens digit plus 1     *:>=ninety
Slot A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P
5:  000 000
6:  000 000 000 000 000 000 000 000
7:  000 000 000 000 000 000 000 000
8:  000 000 000 000 000 000 000 000
9:  000 000
10: 000 000 000 000 000 000 000 000
11: 000 000 000 000 000 000 000 000
12: 000 000 000 000 000 000 000 000

[7] A:\ #
```

setrasostype

Parameter: *Device*

Description: Lets the controller know what operating system is loaded on each segment.

Security: Operator

Limitations: CC9600 Only

Example:

```
[01] A:\ # setrasostype 1a

   Operating System:Ras Express 5.2 (or later)

Operating System

1.  Ras Express pre(5.2)
2.  SCO Unix
3.  Windows NT
4.  Novell Netware
5.  Ras Express 5.2 (or later)
6.  Other

Enter Selection (1,2,3,4,<5>,6, -(previous), q(quit)):
```

setreadcommunity

Parameter: *None*

Description: Changes the Read community settings.

Security: Supervisor

Example:

```
[0] A:\ # setreadcommunity public

Read Community public stored

[1] A:\ #
```

setsendtrap

Parameter: *On, off*

Description: Configures the MR9600 controller whether or not to send traps to an SNMP manager or MultiCommManager console.

Security: Supervisor

Example:

```
[0] A:\ # getsendtrap
The sending of traps is enabled.
[1] A:\ # setsendtrap off
The sending of traps has been successfully disabled.
[2] A:\ # getsendtrap

The sending of traps is disabled.
```

setsubnet

Parameter: *IP Address Mask*

Description: Changes the subnet mask to the mask specified in the parameter. *See **se**.*

Security: Supervisor

Example:

```
[0] A:\ # setsubnet 255.255.255.0

Subnet mask 255.255.255.0 stored

[1] A:\ #
```

settrap

Parameter: *IP Address*

Description: Changes the default trap IP address to the one specified in the parameter. This IP address is where fault and status traps are sent. See ***se**.*

Security: Supervisor

Limitations: Only one default trap address may be set at a time.

Example:

```
[0] A:\ # settrap 199.199.199.6

Trap IP Address 199.199.199.6 stored

[1] A:\ #
```

setwritecommunity

Parameter: *None*

Description: Changes the Write community settings.

Security: Supervisor

Example:

```
[0] A:\ # setwritecommunity public

Write Community public stored

[1] A:\ #
```

sync

Parameter: *None*

Description: Writes oustanding events (events that normally get written every hour) to the B:\#MMM\MR.log directory. The file will be named the current date and hour with an hour extension.

Security: Operator

Example:

```
[01] A:\ # sync

[02] A:\ #
```

t, time

Parameter: *None*

Description: Prompts you to change the time on the MR9600.

Security: Operator

Limitations: The time is not corrected for daylight savings time.

Example:

```
[0] A:\MMM # t

The current time is: 4:59pm

Enter the new time: hh:mm 17:10

[1] A:\MMM # cl

10/30/1996 5:10pm

[2] A:\MMM # t

The current time is: 5:10pm

Enter the new time: hh:mm 5:12pm

[3] A:\MMM # cl

10/30/1996 5:12pm
```

t1cfg

Parameter: *Device*

Description: Sends T1 configuration information stored in nonvolatile memory to the specified device. The specified device must be a T1 device. T1 devices can exist only at 1b, 1c, 5b, 5c, 9b, 9c, 13b, and 13c.

Security: Operator

Example:

```
[0] A:\MMM # t1cfg 1b,5b,9b,13b
```

t1debug

Parameter: *Device*

Description: Displays the status of AB Signalling bits for both the transmit and receive directions of each DSO channel for the specified T1 device within the CommPlete. TX = from CommPlete T1 card to central office. RX = from central office to CommPlete T1 card.

Security: Supervisor

Limitation: CC9600 only

Example:

```
[31] A:\ # t1debug 1b

1.  Enable Signal Bit monitoring
2.  Turn Off signal bit monitoring
3.  Signal Poll interval (4)

=> 1

Completed enabling all selected devices!

[32] A:\ #

  01B         01B
  Tx/Rx       Tx/Rx
  AB/AB       AB/AB
01 00/00      02 00/00
03 00/00      04 00/00
05 00/00      06 00/00
07 00/00      08 00/00
09 00/00      10 00/00
11 00/00      12 00/00
13 00/00      14 00/00
15 00/00      16 00/00
17 00/00      18 00/00
19 00/00      20 00/00
21 00/00      22 00/00
23 00/00      24 00/00
E&M Immediate Start Protocol Tx(AB)  Rx(AB)
           OFF HOOK      11     11
           ON HOOK       00     00
           RINGING       NA     NA

[33] A:\ # t1debug 1 b

1.  Enable Signal Bit monitoring
2.  Turn Off signal bit monitoring
3.  Signal Poll interval (4)

=> 2
```

t1setup

Parameter: *Device*

Description: Sets the T1 configuration information associated with a T1 device. This information is stored in a nonvolatile area of memory so that the device can be properly reconfigured on power-up or reset. The specified device must be a T1 device. T1 devices can exist only at 1b, 1c, 5b, 5c, 9b, 9c, 13b, and 13c.

Security: Supervisor

Example:

```
[0] A:\MMM # t1setup 5b

T1 Card Status:

        LED Information: None
                Framing: AT&T D4 Super Frame (SF)
            Line Coding: Alternate Mark Inversion (AMI)
  FXS Signaling Options: E&M Immediate Start
       Dial-in Address: DNIS
   Acknowledgement Wink: Disabled
         Transmit Level: - 7.5dB
          Receive Level: - 0.0dB
       Firmware Version: N/A

Framing Format

   1. DS1 AT&T Extended Super Frame (ESF)
   2. DS1 AT&T D4 Super Frame (SF)
   3. DS1 ANSI Estended Super Frame
   4. G.704.ITU-T section 2.1.3.2
   5. G.704.ITU-T section 2.1.3.1

Enter Selection (1,<2>,3,4,5, q, -):

Line Coding

   1. B8ZS
   2. AMI
   3. ZBTSI

Enter Selection (1,<2>,3, q, -):

Transmit Level

   1.   0.0 dB
   2.  -7.5 dB
   3. -15.0 dB
   4. -22.5 dB

Enter Selection (1,<2>,3,4, q, -):

FXS Signaling Options

   1. E&M Wink Start Conversion
   2. E&M Immediate Start Conversion
   3. Ground Start Standard
   4. Loop Start Standard

Enter Selection (1,<2>,3,4, q, -):

Dial-in Address

   1. No Address
   2. DNIS
   3. ANI-DNIS
   4. ANI
```

```
Enter Selection (1,<2>,3,4, q, -):

Acknowledgement Wink

   1. Disabled
   2. Enabled

Enter Selection (<1>,2, q, -):

T1 Card Status:

        LED Information: None
              Framing: AT&T D4 Super Frame (SF)
          Line Coding: Alternate Mark Inversion (AMI)
  FXS Signaling Options: E&M Immediate Start
        Dial-in Address: DNIS
   Acknowledgement Wink: Disabled
         Transmit Level: - 7.5dB
          Receive Level: - 0.0dB
       Firmware Version: N/A

Save Changes? (<y>, n): n

T1 Settings have not been changed


[1] A:\MMM #
```

t1status

Parameter: *Device*

Description: Interrogates the status of the specified T1 device. The specified device must a T1 device. T1 devices can exist only at 1b, 1c, 5b, 5c, 9b, 9c, 13b, and 13c.

Security: Guest

Example:

```
[0] A:\MMM # t1status 5b

T1 Card Status:

        LED Information: Red Alarm, Sync Loss
                Framing: DS1 AT&T Extended Super Frame (ESF)
            Line Coding: Binary 8 Zero Substitution (B8ZS)
  FXS Signaling Options: E&M Wink Start
       Dial-in Address: No Address
   Acknowledgement Wink: Disabled
         Transmit Level: - 0.0dB
          Receive Level: - 3.0dB
      Firmware Version: 1.00C

[1] A:\MMM #
```

type

*See **cat**.*

unmount

Parameter: *Specifier*

Description: Remove the drive from the operating system. This is commonly done before formatting the drive.

Security: Supervisor

Example:

```
[01] A:\# unmount b:

[02] A:\ # format b:

[03] B:\ #
```

update

Parameter: *Pathname Device*

Description: Updates the firmware of the controller, of a T1 device, or of up to eight modems. *Pathname* is the path of the file used to update the firmware. The file name extension determines which device is updated: .HXC updates the controller; .HXT updates the T1 card; and .HEX updates modems.

Security: Operator

Limitations: Only eight modems can be updated at one time, and only one update can be performed at one time.

Example:

```
update hd8803t.hex 2b:2h
Update started.
[11] A:\MMM # update

Percent Done = 03%
2B Updating
2C Updating
2D Updating
2E Updating
2F Updating
2G Updating
2H Updating

[12] A:\ # abort 2b

Are you sure you wish to abort the update? (y/n) y

Aborting . . .
```

upload

Parameter: *Pathname*

Description: Uploads from a computer connected to the MR9600 controller's serial port connector the file specified by *pathname*. Before uploading, binary files must be converted to ASCII data on the source computer using a utility supplied by Multi-Tech. The format for the data is one or more lines of hexadecimal data up to 80 characters in length, where each hexadecimal value is bracketed by square brackets (e.g., [2b][3c]...[1c]). When the file has been uploaded, press ESC or CTRL+D to complete the upload.

Note: For debugging use only under the direction of Technical Support personnel. Files will normally be transferred using FTP.

Security: Supervisor

Limitations: Only ASCII files can be uploaded. This command does not support flow control, so the files should be uploaded using an ASCII file transfer protocol with a 1 millisecond delay between lines.

Example:

```
[0] A:\MMM # upload mr9600.db
```

...data uploaded here...

```
2192 byte(s) written to 'mr9600.db'

[1] A:\MMM #
```

uptime

Parameter: *None*

Description: Displays the date and time since the last boot. Displays in Days, hours, minutes and seconds how long the system has been running.

Security: Operator

Example:

```
[05] A:\ # uptime

System up since - 12/18/1997 12:57pm - 0 Days 2 Hours 47 Minutes 15
Seconds

[06] A:\ #
```

usage

Parameter: *Specifier*

Description: Displays how many modems fit the following parameters: received inbound calls, made outbound calls, were Out Of Service (OOS), were not respnding and were free per specified time intervals since the controller was last started (24 clock and specifier is in minutes). The example below shows the controller came up at 1:00 PM, has been running for 20 minutes and has taken 4 inbound calls.

Security: Operator

Example:

```
[01] A:\ # Usage 10

Time   Inbound   Outbound      OOS    NotResp       Free   Total

13:00  0         0             0      0             23     24
13:10  0         0             0      0             24     24
13:20  4         0             0      0             20     24

[02] A:\ #
```

userid

Parameter: *None*

Description: Changes your user ID by prompting you for your current user ID and new user ID.

Security: Guest

Example:

```
[0] A:\MMM # userid

Current user id: super
New user id: supervisor

Security information updated

[1] A:\MMM #
```

ver, version

Parameter: *None*

Description: Displays the current version of the MR9600's firmware.

Security: Guest

Example:

```
[0] A:\ # ver

Version 2.10 (Jan 09 1998 18:06:37)

[1] A:\ #
```

whoami

Parameter: *None*

Description: Displays the user ID of the user who is logged on, and the user's security level.

Security: Guest

Example:

```
[0] A:\MMM # whoami

supervisor with < supervisor> access rights

[1] A:\MMM #
```

Error Messages

This section lists the MR9600-100's error messages and their possible causes. Many error messages are caused by human error. When you receive an error message when executing a command, ask the following questions first:

- Did you spell the command correctly?
- Do you have access rights to the command?
- Do you have the correct number of parameters in the correct format?

ERROR: Illegal command

The command is spelled wrong, or you have the wrong number or incorrect parameters.

ERROR: Invalid IP address, format ###.###.###.###

The IP address is not 4 groups of up to 3 digits separated by a period. The IP address has no components with a value greater than 255.

ERROR: Invalid user id — user id not changed

The user ID contains an invalid character.

ERROR: Unable to perform command

User does not have the security access to execute the command.

ERROR: Make directory 'DIRNAME' failed.

The subdirectory 'DIRNAME' already exists.

ERROR: Unable to rename 'DIR1' to 'DIR2'

DIR1 does not exist, or you are attempting to rename the current working directory.

ERROR: Online session already exists

The **online** command is active by either a Telnet session or a terminal attached to the CC9600.

ERROR: No history is being maintained

The command history buffer is empty or not being maintained by the command line interface.

ERROR: Password not changed

The old password does not match the stored password; the new password is invalid; or the new password and the repeated new password do not match.

ERROR: Unknown error

An error of unknown origin occurred while the MR9600-100 was attempting to parse a command line.

ERROR: Bad or missing configuration file

The specified configuration file is not present on the system. It is possible that the file name is incorrectly spelled.

ERROR: Invalid number

The specified number is not a valid hex number starting with *$* or a valid decimal number starting with a digit.

ERROR: Invalid device specifier

The device specifier is invalid since it is not of the format *1a*, where *1* represents the slot number for the device and *a* represents the device number. See “Parameter Types” on page 24.

ERROR: Invalid drive specifier

The specified drive letter does not belong to a drive that is available to the system.

ERROR: Security information not changed

The new user ID is invalid. The new password is invalid; or the new password and the repeated new password do not match.

ERROR: Unable to update security information

The CMOS write error failed when updating the security information.

5 Solving Problems

Introduction

This chapter provides information needed to identify and fix problems with the MR9600-100. Problems can be diagnosed by observing the LED indicators on the MR9600-100's front panel, or through the dedicated management console's screen. Also, problems can be found by performing the diagnostic tests documented in Chapter 8 of the MultiModemManager *User Guide* Manual.

For specific MultiModem troubleshooting information, refer to the MultiModem *Owner's Manual* shipped with your MultiModem. For basic Windows messages, refer to your Windows manual or Help screens. For a description of the MR9600-100's LED indicators, see Chapter 1.

MR9600-100 Diagnostic Tests

If you suspect that your MR9600-100 is not functioning properly, you can run the following diagnostic tests to test the MR9600-100's hardware capabilities.

1. Refer to Figure 3 on page 12 to locate the test jumper on the MR9600-100 Controller card. Put the test jumper into the loopback position, so the two pins are shorted together. Reinstall the MR9600-100 assembly into the CC9600 chassis. Plug the 10Base-T loopback jumper into the Ethernet connector labeled "LAN" on the rear of the CC9600 chassis.
2. Run MultiExpress or another datacomm program on a PC at *115,200 bps* with *no flow control*. Connect the COM port used by the datacomm program to the MR9600-100's RS-232 port on the rear of the CC9600 chassis.
3. Reset the MR9600-100 by pressing the reset button on the front with a paper clip, or turn the CC9600 chassis off and on.
4. When prompted to start manually, press a key.
5. When prompted to enter a user name and password, log in as **supervisor**.
6. Type the command **HDTEST** and press ENTER.
7. You will see a menu. Proceed with testing in the following order:

   WARNING: Running options out of order or ones not specified may cause unpredictable results.

   Test 2 Red LEDs on.

   Test 3 Green LEDs on.

   Test 4 All LEDs off.

   Test 5 Flash memory test.

   Test 7 Ethernet loopback test.

   Watch for the green Ethernet LED on the left side of the front panel; it should be on solid. Numbers stopped and packets received will match.

   Test 1 Start backplane. LEDs on the front panel of the MR9600-100 should reflect the number of cards installed.

   Test a Sets segment 1 modems to 9600 bps.

   Test b Sets segment 1 modems OOS.

Test c Clears segment 1 modems OOS.

Test d Resets segment 1 modems.

Appendix A - Connector Pinouts

This appendix describes the RJ-45 connector pinouts, and discusses categories of Ethernet cabling..

RJ-45 Connectors

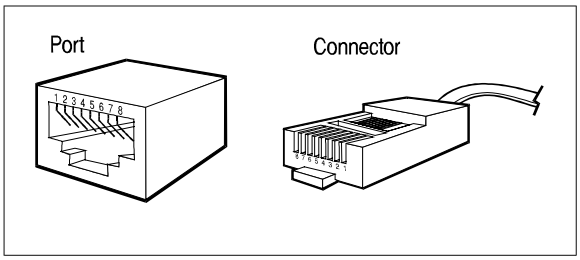

Figure A-1 RJ-45 Connector

The above figure shows the arrangements of the pins, while Table A-1 lists the pinouts.

Table BA-1: RJ-45 Connector Pinouts

Pin	Signal
1	TD+
2	TD-
3	RD+
4	*NC*
5	*NC*
6	RD-
7	*NC*
8	*NC*

A schematic for crossover cables is shown in the following figure.

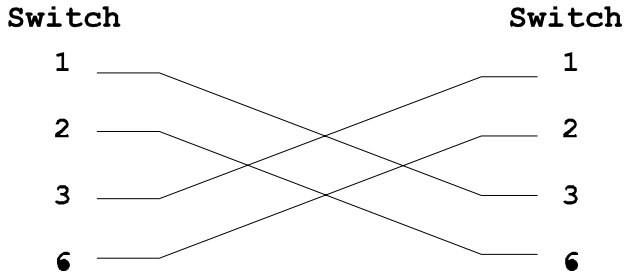

Figure B-2 Crossover Cable

Appendix B - Categories of Ethernet Performance

The telecommunications industry has defined cable and cable component standards in terms of performance "categories". The standards cover cable thickness, outer jacket material and thickness, etc. The categories specify the tests which the cable and components must pass to meet the standards. The two categories of test standards currently in use are Category 3 and Category 5.

Category 3 ("Cat 3") cabling is used for voice and data at speeds up to 10M bps (e.g., 10BaseT Ethernet). Category 5 ("Cat 5") cabling is used for 100M bps transmissions (e.g., 100BaseT), but is also fully capable of 10M bps transmission. Both categories use 24 gauge wire.

The self-certifying tests for cabling and components involve a swept-frequency test. Cat 3 must pass all signals from 1-16M Hz; Cat 5 must pass all signals from 1-100M Hz. All forms of modulation of any carrier waves within those frequencies, as well as all forms of digital pulses must be supported for any and all applications. Since handling digital pulses is more difficult than simple modulation, digital pulsing requires a broader range of frequencies to provide square pulse edges (as compared to AM or FM modulation).

Category 3 (Cat 3)

Cat 3 cabling and components are designed and tested for 16M Hz of communications bandwidth for 10M bps voice and data/LAN traffic transmissions. Cat 3 is very common in voice telephone cabling. The Cat 3 technical specifications are defined by FCC Part 68, ANSI/EIA/TIA-568, TIA TSB-36, and TIA TSB-40. Safety specifications for Cat 3 cabling are covered by UL 1459 (telephone), UL 1863 (wire and jacks), and NEC 1993 (article 800-4).

Category 5 (Cat 5)

Cat 5 cabling and components are designed and tested for 100M Hz of communications bandwidth for 100M bps voice and data/LAN traffic transmissions. The Cat 3 technical specifications are defined by FCC Part 68, EIA/TIA-568, TIA TSB-36, and TIA TSB-40. Safety specifications for Cat 3 cabling are covered by UL 1459 (telephone), UL 1863 (wire and jacks), and NEC 1993 (article 800-4). Cat 5 cabling is required for use with Ethernet 100BaseTX (Fast Ethernet over Category 5 wiring) networks.

Cat 5 wiring has advantages over Cat 3 in its operation (full-duplex) wire-twist structure (tighter), insulation (better), and connecting hardware (more versatile). Another advantage with using Cat 5 is that it works for legacy 10M bps as well as newer 100M bps equipment.

However, Cat 5 has some installation requirements that must be met:

- Never use staples to mount or fix Cat 5 wiring.
- Velcro is recommended in place of tie wraps. Wrap cable in bundles very loosely if you use tie wraps.
- Never untwist the wire at the punch-down block or jack termination; the twists should remain right up to the termination.
- Never strip off more jacket insulation than is required to make the termination.
- Do not pull too hard on the cable (especially around corners).
- Do not pull on a cable to straighten out a loop or kink. Instead, always untwist the cable at the location of the loop or kink.
- Do not stuff too many cables into too small of a conduit.
- Refer to the applicable Commercial Building Telecom Wiring Standard for specific information.

The Ethernet 100BaseT standard is implemented for three cabling environments: copper wire (100BaseT2), UTP (100BaseTX), and fiber (100BaseFX). Since the 100BaseT spec is built on the 10BaseT spec, it is an easy upgrade from 10M to 100M bps, without impact on users, existing operating systems, or network management applications. 100BaseT provides increased throughput compared to 10BaseT by decreasing the latency period between bits, effectively increasing packet speed by a factor of 10.

100BaseTX uses two pairs of 24 gauge wire, one pair for transmitting and one pair for receiving. Upgrading a network from 10M bps to 100M bps Ethernet requires 100BaseTX NICs and Hubs as well as the Cat 5 wiring to connect them. It is strongly recommended that end-to-end testing be performed to verify proper installation of Cat 5 connection to the Cat 5-compliant wall jacks and patch panels.

100BaseTX Connectivity Rules:

- the max. length of a twisted-pair segment (e.g., the distance from a Hub port to a PC/NIC) is 100 meters.
- the max. diameter in a collision domain is approx. 205 meters (672.5 feet) using two Class II Hubs and 200 meters (656 feet) using one Class I Hub.
- up to three segments and two Class II Hubs (or two segments and one Class I Hub) may exist between any two end stations in a collision domain.

Index

#

#character, 19

1

10Base-T connector, 5

A

ASCII text files, 37

C

CC9600 chassis, 2, 3, 12, 13, 18, 40, 82
changing directories, 37
chassis, 13
colon in *device* parameter, 24
commands
!!, 33
!a, 34
!n, 34
?, 33
boot, 35
cat, 33, 35, 37, 40, 51, 52, 53, 72
cd, 19, 37
cfg, 37
chdir, 37
cl, 38
clock, 38
config, 20
configure, 37
copy, 38
cp, 38
d, 38
date, 38
del, 39
delete, 39
dir, 39
download, 40
getcalls, 20, 41
getfaults, 20, 41, 43, 44, 46, 48, 51, 52, 64, 65, 66, 68, 74, 75
getfkey, 42
getgateway, 42
getip, 42
getmodems, 20, 43, 62
getreadcommunity, 45
getsendtrap, 45
getsubnet, 46
gettrap, 46
getwritecommunity, 46, 47
history, 33, 34, 47
lo, 47
logout, 20, 47
ls, 39
md, 48
mkdir, 48
oc, 49
online, 49, 77
oosclear, 20, 49
oosclr, 49
oosset, 20, 50
os, 50
passwd, 18, 51
password, 51
rd, 54
readme, 53
remdir, 54
ren, 54
rename, 54
rendir, 54
reset, 20, 54
rm, 39
rs, 54
se, 56
security, 61
setconfig, 62
setenviron, 56
setfkey, 63
setgateway, 63
setip, 63
setreadcommunity, 66
setsendtrap, 45, 66
setsubnet, 67
setwritecommunity, 67
t, 68
t1cfg, 68
t1setup, 69, 70
t1status, 72
time, 68
update, 73
upload, 74
userid, 18, 47, 75
ver, 76
version, 76
whoami, 76
community settings, 45, 46, 66, 67
community strings, 18
concentrator, 4
configuration
MR9600, 13
T1 devices, 68, 70

configuration files, 18, 21
connectors, 4, 13

D

date and time, 38, 68
deleting a file, 39
device identifier, 24
device parameter, 24
diagnostics, 13
directories, creating, 48
directories, deleting, 54
directories, renaming, 54
display commands, 26
downloading a file from the MR9600, 40

E

environment commands, 26
environment values, 56
error messages, 77
Ethernet
  10Base-T connectors, 5, 12
  concentrator module, 2, 12
event files, 18, 19, 21

F

file commands, 27
file system, 18
firmware version, 76
firmware, updating, 73
front panel, 3, 12
FTP (File Transfer Protocol), 2, 18, 19, 21, 40, 74
function keys, 42, 63
fuse, 5

G

Guest security level, 30

H

HTML interfaces, 20

I

inactivity timer, 20
indicators. *See* LED indicators
installation, 12
Internet, 2, 20, 21
IP address, 19, 20, 24, 25, 46, 63, 77
  gateway address, 42, 63
  MR9600 address, 42
  trap address, 67
IP address mask parameter, 25
IP address parameter, 24

L

LED indicators, 3, 4, 5, 82

M

mask, IP address, 25
memory, 5
microprocessor, 5
MMM directories, 18
modem control commands, 28
modems
  configuring, 37
  managing, 20, 21, 49, 50, 54, 62
  monitoring, 20, 41, 43
MultiExpress, 82
MultiModemManager, 12, 13, 18, 19, 21, 37, 66, 82

O

Operator security level, 30

P

parameter types, 24
password, 18, 19, 21, 51, 61, 78, 82
passwords
  default, 18
pathname parameter, 24
power supplies, 12
processor, 5
prompt, command line, 19
PS9600 power supplies, 12

R

remote management, 20
renaming a file, 54
repeating a command, 33, 34
reset button, 82
resetting the MR9600 controller, 35

S

security, 18, 19, 21, 30, 61, 76, 77, 79
  commands, 28
  files, 18, 21
  guest level, 18
  Guest level, 30
  operator level, 18

Operator level, 31
supervisor level, 18
Supervisor level, 30, 32
self-test, 12
serial connector, 19
SNMP, 2, 13, 18, 19, 21, 37, 66
specifications, 5
Statistical Analyzer, 19, 21
subnet mask, 46, 67
supervisor console, 13
Supervisor security level, 30, 32
system commands, 29

T

T1 device, 68, 70, 72, 73
TCP/IP, 2, 5, 13, 18, 19, 20, 21
Telnet, 2, 18, 19, 20, 77
traps, 19, 45, 46, 66, 67

U

updating firmware, 73
uploading a file to the MR9600, 74
user ID, 18, 19, 21, 61, 75, 76, 77, 78
default, 18

V

viewing ASCII text files, 37

W

Web browsers, 20
Web management, 21